Pit and Quarry

SAND-GRAVEL-STONE
CEMENT-LIME-GYPSUM

Vol. XIII, No. 5. *DECEMBER 8, 1920* Circulation 7,000

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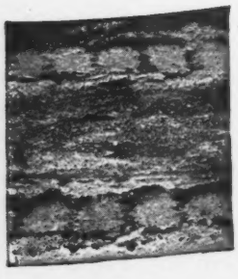

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Pit and Quarry

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Next Issue December 22, 1926

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See the 1927 ROAD SHOW WEEK of JAN. 10

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Pit and Quarry

Vol. 13 CHICAGO, ILL., DECEMBER 8, 1926 No. 5

WHAT'S AHEAD FOR 1927

B. F. Affleck,
Universal Portland Cement Company,
Chicago, Illinois.

"Prior to 1922 the country had never used as much as 100 million barrels of cement in a single year. Since that time there has been a steady increase each year until shipments reached about 157 million barrels in 1925. Shipments for the first ten months of this year were a little more than for the corresponding period last year. Assuming shipments for the last two months of this year to be about the same as those for the last two months of last year, the total for 1926 will be slightly greater than for 1925.

"Thus the curve of cement shipments which had moved upward for several years has been flattening out during the last two years. Predictions have been made in some quarters of less building in 1927 than in 1926 and it might appear that these predictions contemplate that the curve of cement shipments will start downward. Similar predictions of a decline in building were made a year ago, but the volume this year will probably exceed that for 1925. In the same way present predictions may turn out to be inaccurate but it is not likely that the volume for 1927 will equal that for 1926. But even if there should be a decline in building next year, a substantial decrease in cement shipments need not necessarily result. Uses to which cement is put have become so many and so varied that a temporary decline in one or more uses is likely to be offset by increases in others or by the development of new uses. A recent estimate of the channels of use is as follows:

Commercial buildings	26 per cent
Dwellings	8 " "
Paving	28 " "
Farm uses	18 " "
Sidewalks	6 " "
Railways	5 " "
Miscellaneous	9 " "

"Any decrease then in building would affect only a comparatively small part of the cement used. At least some of the other items may be expected to increase. Paving is the largest of these and destined to grow. The Highway Departments of a number of states have laid out definite yearly programs and steady growth of the paving movement seems assured. Other states are almost certain to follow those that have been more progressive in this respect. As an example, Illinois is one of the leading states in providing its citizens with dependable highways and Iowa is one of the most backward. It is inconceivable that Iowa will for long be content to occupy its present position when its next door neighbor is making such progress. Other situations of this kind exist and eventually will be corrected.

"Ordinarily the large paving programs now in effect and those contemplated are thought of as applying to country highways. But street paving is fast taking its place with country roads as a channel for the use of cement. Concrete streets are becoming more numerous in our cities, and towns and even villages are taking up the paving idea. Another phase of the paving situation that is assuming prominence is the widening of existing pavements. The highway or city street paved even within the last few years is not now looked on as a finished job. Many of them are being, and others must be, widened to accommodate the constantly growing traffic. But with all this activity in providing better and wider roads and streets, the growth in mileage of pavement is at a much slower rate than the increase in number of automobiles.

"If automobiles are to grow in number at the present rate there must be a large increase in the rate of paving. Automobiles cannot run without pavements to run on.

"Of the other uses of cement the farm occupies a place of prominence as it does with respect to many other lines of industry. The condition of farmers has been such of late years that they have not been as large users of cement as they may reasonably be expected to become as their condition improves. Railways are more prosperous than for many years and will be large users of cement on their

rights-of-way and at terminals. Miscellaneous uses include all sorts of small items and some large ones like water power developments, bridges, docks and concrete products. The last item is one whose importance is not generally realized. The manufacture of blocks, pipe, tile, etc., is developing into a large industry in itself and provides use for many thousands of barrels of cement throughout the country.

"So a possible slowing up in building is not a matter of as great concern to the cement industry as it might appear. But there is another matter of great concern to the cement industry. It is over-production, or rather over-capacity to produce. Only a few years ago the annual capacity of all cement mills was around 120 million barrels. Now it is about 200 millions and before the end of 1927 new mills now building and additions to existing mills will raise the capacity to upwards of 210 million barrels. This year shipments will be about 25 per cent less than capacity. With a larger capacity in 1927 the ratio of shipments to capacity probably will be still smaller.

"Farmers have shown that they can produce too much cotton. Manufacturers can produce too much cement. One result will be less cotton acreage next year. Another will be cement mills idle or partly so."

W. B. Newberry,
Sandusky Cement Company,
Cleveland, Ohio.

"I see no reason why the favorable conditions now existing should not extend throughout the next year. Although the backward Spring of 1926 delayed construction, and consequently, cement sales for perhaps three weeks beyond the normal, this has more than recovered during the summer, and we are now completing one of the very best years in the industry.

"The feeling of apprehension which prevailed last year, and, to a certain extent, in the early part of 1926, owing to the disinclination of consumers to purchase largely for storage and to carry heavy stocks, has disappeared, and it is recognized that this is a nation-wide tendency, not confined to the cement industry, and based on the confidence of the consumers that, as they need material, it will be forthcoming; thus, showing a greater confidence in the ability of manufacturers to fill orders promptly, than has been the case heretofore.

"As I see it today, there is no serious obstacle in the future to a continuation of the present prosperity, well into, if not through 1927."

H. Struckmann,
International Cement Corporation,
New York City.

"While I believe the consumption of cement next year will be very nearly equal that of 1926, prices will undoubtedly be lower due to ill-advised promotion of new plants in localities where ample production to take care of present and future requirements is already available."

W. W. Fischer,
Fischer Lime and Cement Company,
Memphis, Tennessee.

"While it is true that the mills will go into the winter with larger stocks than for several years past, the indications are that road work and other large projects will consume in 1927 as much cement as was used this year. Some sections, especially in the South, there is an over-production due to a number of new mills being put into production. Taken as a whole, it is my belief that the industry will enjoy a normal year."

E. H. Roth,
Sheboygan Lime Works,
Sheboygan, Wisconsin.

"To judge by reports from our dealers in the principle cities of Wisconsin, Illinois, Minnesota, Iowa and Michigan the prospects are that Lime sales in 1927 will be equal to the sales in 1926. The Twin City dealers have been disappointed in the 1926 sales but are looking forward to an increased building program in 1927. In Iowa, improving financially, they feel there will be much more building during 1927 than this year.

"We quote from a letter on this subject received from our sales manager, 'Many building projects are contemplated throughout Wisconsin, many plans are being made, and we believe that the chances are very good for the work to go ahead next year. There seems to be no curtailing of building operations in Chicago, and in this district, from information I have secured, there will be just as much building next year as there has been this year.'"

Philip L. Corson,
G. & W. H. Corson,
Plymouth Meeting, Pennslyvania.

"We have great faith in the future for the lime industry although we do not know whether the turning point will be reached in 1927. If the manufacturers can only get together and put on the proper campaign for the promotion of lime in the many uses for which it is so well adapted, we can see no

reason why the present plants would not be very inadequate to supply the demand.

"There can be no doubt that every bag of cement should have five to ten pounds of lime with it. Data substantiating this claim is now available and it is only necessary to make these facts generally known. The great weakness of the lime industry is, we feel, that it lacks organization and until it does become organized in much the same manner as the cement industry, it cannot hope to more than dent the field. The National Lime Association is undoubtedly doing its best to promote the numerous advantages of lime but before real results can be obtained by them, they must have the thorough cooperation of practically all of the lime manufacturers."

F. A. Wilder,
Southern Gypsum Company,
North Holston, Virginia.

"The Gypsum Industry, which is now closing a successful year, is like all other industries inquiring about the prospects for 1927. While it may not be quite so easy to forecast the future as it was a year ago, it seems fairly safe to say that the outlook for another good year is fairly bright. Building permits are holding up well and the success of gypsum products in some of the newer fields which they have entered means further expansion in those fields. This statement applies particularly to gypsum wall-board, gypsum tile, and structural gypsum.

"In the Southeast the low price of cotton has raised some question about the ability of this section to absorb gypsum products next year in quantities equal to those of the past year. Uneasiness on this score is gradually disappearing. The great size of the crop in some measure offsets the lower price per pound, and financial interests in the South have taken steps that promise to stabilize marketing at least to some extent. During 1926 Florida passed through a period of readjustment in connection with building materials as well as everything else. The great quantities of cement, lime and gypsum that were shipped into the state during the latter part of 1925 have been absorbed, and ordering for current use in that state is now on the increase."

United States Gypsum Company,
Chicago, Illinois.

"The expected decline in the building industry is under way. Prosperous years brought the expected new companies and increased production. In face of the lessened demand this means increased competition both for the manufacturer and the dealer. The task is to meet lessened demand with the sale of more products. Where a dealer sold two commodities for the construction of a home it now is his job to sell four; where he sold four it now is his job to sell eight, and so on.

"Gypsum manufacturers have had their ears to the ground. It was unreasonable to expect that building would continue at the rate of the last few years. Leaner times were inescapable. Therefore the gypsum manufacturer set to work to devise new uses for his basic product and to make these uses so economically sound that they would win out solely on their merit any time they were forced into direct comparison with the materials they supplant.

"One of the first of these new products to be introduced was fireproof gypsum sheathing, used in place of wood sheathing in wood frame construction. Gypsum sheathing will not warp or shrink. Its tongue and groove edges result in a wall that is sealed against the infiltration of wind. It can be nailed and sawed with the ease of wood. It provides a perfect backing for any type of exterior finish. And it has the natural insulating properties of gypsum.

"A companion product is gypsum lath—literally a rock lath—that is used in place of tinder-like wood lath. This material has the same fire-resistive and insulative properties as the gypsum sheathing. Tests have demonstrated that plaster sticks tighter to it and that it withstands more abuse than any other type of lath.

"These products just enumerated fit in ideally with the trend toward fire-safe residence construction. In the field of insulation, too, the gypsum manufacturer has provided his dealer establishment with a material that virtually makes the dealer an insulation expert. This material is a dry flaky substance that is simply poured in place over lath and plaster, between rough and finished flooring or between walls. It is one of the most effective insulating materials yet devised, and it further, because it is incombustible, acts as a fire-stop wherever it is installed.

"These and similar products provide the dealer with effective weapons with which to combat the decline in building. And the aggressive dealer has been quick to utilize them. Instead of just selling the plaster as his gypsum item, he has got on the job and sold the sheathing, the lath and the insulation. As a result four items have paid him a profit instead of one. And it is these tactics that will enable aggressive dealers everywhere to maintain profits at a satisfactory level even while building is on the down-grade.

"Another recent introduction by a gypsum manufacturer is acoustical plaster. The use of this material makes it possible to determine the acoustical efficiency of a church, theater, auditorium, school room, etc., before the structure is erected. Acoustical plaster is the outcome of more than 30 years research into the physics of sound by the late Professor Wallace C. Sabine of Harvard University, and Dr. Paul E. Sabine."

F. G. Ebsary,
Ebsary Gypsum Company, Inc.,
Wheatland, New York.

"All I can see is sunshine. We are going to have the biggest year we have ever experienced in the Gypsum business. 1926 was our banner year, and we look for 1927 to be much larger."

C. L. McKenzie,
Duquesne Slag Products Company,
Pittsburgh, Pennsylvania.

"During the year 1926, probably all the slag producers handled a somewhat larger volume than in 1925, with prices tending to ease off a little, and the business requirements in the direction of satisfying the customers on quality and service somewhat more urgent than heretofore. Believe the tendency for the coming year will be in the same direction, with a chance that general business will slacken off a little so that the volume of sales of mineral aggregates including slag may not exceed in 1927 the total of 1926.

"The railroads are showing disposition to spend money, while at the same time the road-building programs are not yet completed and will continue to take large quantities of materials for construction. Altogether the prospects for 1927 promise fairly well, and in results may equal 1926."

Otho M. Graves,
The General Crushed Stone Company,
Easton, Pennsylvania.

"In several states the funds obtained for highway building through previous bond issues are exhausted and the electorate is determining whether new bond issues will be put forth. There is reason to believe that each of the states involved will act favorably. If so, there should be no diminution in highway construction. The demand for paved roads of greater durability and width, able to take more and heavier traffic, is constantly increasing.

"Railroads will doubtless continue to use stone ballast at approximately the same rate as heretofore. There is no alarming sign of reduction in general building programs. In general, we think the market should be as strong in 1927 as in 1926. The present flurry in coal prices will probably have subsided by the spring of 1927 and if no strike in the bituminous fields eventuates prices of coal should approximate those prevailing in 1926.

"Wages may be slightly higher next year than in the one just ending. The price at which crushed stone is sold will probably not change much in the various sections of the country, although as between sections there is some variation, which will continue. There is no reason to believe that material required by our industry will particularly increase in price, although there may be some slight increase reflecting possible increase in wages."

E. J. Krause,
Columbia Quarry Company,
St. Louis, Missouri.

"Indications point to fairly active conditions for 1927 in the crushed stone industry. Everywhere there is evidence of closer inspection of coarse aggregate. Better preparation is demanded and really needed for the good of the industry. Gradation is receiving more attention. Segregation also is a problem.

"Quarries using coal for power face a higher coal cost due to an exceptionally heavy export of American coal, brought about by the protracted strike in England, Germany's prohibition of further export and the certain nation-wide strike of union miners in the United States April 1, 1927, which will have its effect on the cost of producing stone."

Stuyvesant Peabody,
Consumers Company,
Chicago, Illinois.

"Conditions beyond the control of the producer often affect the seasons' demand as well as the market, therefore, it would be bombastic for anyone to make predictions. As well attempt to forecast the future. However, we can record impressions and we often like to play with figures and possibilities. Some day we are going to have a let-up in the general prosperity of this country. That is what the bankers say, anyway. They seem to be a little cagey about using the word "depression." When this let-up comes, new buildings and construction work are going to be retarded. This will directly affect the stone industry.

"We have gone through two or three unusual years in this community. Notwithstanding the long continued abnormal demand, it is believed that the quarries have made only a small profit. Prices hardly net a reasonable and fair return, due to poor business co-

operation on the part of some or all of us. So, if the demands keep up reasonably during 1927, we look to a considerable output of crushed stone. Everybody will be fairly busy but the mad competition for tonnage without consideration of a fair return is still among us and with the close of the season upon us and no change in the situation, it looks as if 1927 will be a repetition of last year's fight for tonnage without regard for profits.

"Unless a leader springs up or something else is done to halt the production orgy, it would look as if the quarry people might eventually meet the problem which confronted mine owners when low prices brought about many serious financial difficulties and the closing of a great many valuable properties. As business men, we who are in the stone industry should strive for better prices and a more sensible production program. Programs of the motor car, bus, truck and pleasure cars with owners and patrons alike demanding better and wider pavements which is best evidenced in all communities in voting for bond issues for said improvements.

"The demands for fluxing stone is assured on account of heavy demands on steel mills for the production of rails and structural steel both for bridges and buildings. Agricultural limestone should be in great demand as the weather conditions of 1926 seriously retarded its use and the farmers and their farm bureaus, realizing its benefits for soil treatment will surely take this advantage of so aiding in additional yield per acre. Also, the farmer's demands for better type of buildings of concrete construction will require a very large tonnage."

F. W. Stolle,
Casper Stolle Quarry & Contracting Co.,
East St. Louis, Illinois.

"If the one hundred million bond issue for State Highways is released early in the year it will have a great stimulating and stabilizing effect on the industry as a whole, if contracts are let early it will confine a large production of stone to this particular channel which in the absence of this market, would seek an outlet by spreading over a much larger territory, thus creating a highly competitive market in districts that at present are fairly stable with a well established scale of prices. The tentative plans for buildings in this district for 1927 appear to be as favorable as for the year just closing, and if they are carried out as proposed, will help the situation very materially.

"The farmers in the territory we reach have had a very poor year, due to excessive rains and floods, and we very much doubt if the business for 1927 on Agricultural Limestone will approximate that of 1926 as in many instances they have lost their entire crop by floods and their more fortunate brothers have been unable to plant their full acreage owing to wet ground, thus curtailing the purchasing power of all. This will affect our industry both directly and indirectly. Our business for 1926 on Agricultural Limestone will be about 16 per cent of our total tonnage.

"To sum the situation up it appears to us that the State Highway program is the keystone to the entire structure, and as the highway goes so goes the industry in 1927."

O. P. Chamberlain,
Dolese & Shepard Company,
Chicago, Illinois.

"The season of 1927 in the crushed stone industry promises better business than 1926, provided contracts involving the expenditure of at least 25 per cent of the $100,000,000 Illinois State Bond issue are let within the next sixty days. Business will experience a notable "pick-up" if the State Highway Department is able promptly to start this highway work.

"It is the writer's opinion that building construction in the Chicago district will fall off as compared with 1926. There should, however, be a fair Chicago and Cook County business during 1927, probably 70 per cent of the 1926 business. It seems likely that the territory within a radius of 100 miles of Chicago, which is really the market for the Chicago district, will demand a much larger quantity of crushed stone for concrete aggregates and other highway construction work than in 1926.

"The prospects for a large volume of agricultural limestone depends entirely upon the financial condition of the farmers. The farmers of Illinois know the value of agricultural limestone. They will purchase in good volume if their finances permit. The unfortunate weather condition in harvesting the 1926 crops was a serious drawback to the 1926 agricultural limestone business. The disastrous results of the wet fall season of 1926 will be seriously felt at least during the early part of 1927. Should crops be good and weather conditions be fine the fall of 1927 will see a great revival of the agricultural limestone industry in Illinois."

T. Frank Quilty,
Superior Stone Company,
Chicago, Illinois.

"Good as the year 1926 was, 1927 appears to be even better. The volume of proposed work is enormous not only in the Chicago Dis-

trict and its immediate adjoining territory, but throughout the states of Missouri, Iowa, Wisconsin, Illinois, Indiana and Michigan, the same prevails.

"The unusual rains during the present year not only caused work to start fully a month late in the Spring, but also seriously injured both construction and production and was a heavy handicap during the present year. The greatest injury to the crushed stone industry was the almost total failure of the Agricultural Limestone market. The need of this material was very great and the indicated demand should have taken all of this class of stone that the quarries in this vicinity could produce, but the excessive rains seriously damaged the harvest thus curtailing the farmer's purchasing power and left the ground in such a condition that those who would have been able to purchase could not enter their fields. This loss should be made up during 1927 if the weather is at all normal.

"The year 1927 should strain the capacity of the plants in the Chicago District to produce the amount of crushed stone required and the principal thing that the industry should guard against is the quoting of prices that do not yield sufficient profit."

M. F. Hall,
The Ohio Marble Company,
Piqua, Ohio.

"We are anticipating a much better year in 1927 than 1926 has been. Owing to the conditions in the Steel Industry and the excessive amount of rain throughout this section of the country, our business has been unusually light. Due to this fact much road work has not been let. This work should come in the Spring of 1927. Our other lines have been about normal but we are making some changes and readjustments whereby we hope and are planning for an increased business so that our outlook for 1927 is very optimistic."

J. A. Foley,
Federal Stone Company,
Chicago, Illinois.

"We have reasons to believe that the 1927 season will be one of great demand not only for Crushed Stone but for many other lines of construction materials and we are planning to increase our production of Crushed Stone in anticipation of a larger demand than we have yet experienced."

W. J. Sprow,
The Wagner Quarries Company,
Sandusky, Ohio.

"The year 1926 has been about the best year we have ever had and we think the same condition holds true for most of the limestone quarries in this section of the country.

"From the unfilled orders and contracts which we still have on our books and from the proposed work now talked of in this section we can truthfully say that we believe the year 1927 will be one of the greatest years the Crushed Stone Industry has ever enjoyed. We are giving you this opinion after giving careful consideration to all factors that enter into a busy and successful year.

"We might add that all of our quarries are now in full operation and only a few days ago we commenced to work one of our larger quarries on 24 hour per day schedule and this was done purely to try to get some of our work finished up before the big rush commences next year."

I. W. Wortman,
North Jersey Quarry Company,
Morristown, New Jersey.

"We expect the railroads to take their usual supply of ballast for maintenance work. In fact, it may run a little higher than the average on account of heavy traffic over their roadbeds at the present time. Some of the railroads in this territory plan quite extensive improvements which will take additional material.

"About the usual amount of money will be available for road and street work. We rather expect a slackening up for material required for industrial and residential building. This work has been taking large quantities of stone for the past two years and shows indications of getting somewhat caught up to the demand. On the average we expect 1927 to compare favorably with the last two seasons."

A. E. Wiser,
Buffalo Cement Company,
Buffalo, New York.

"We anticipate that the coming year will be a normal one. From present indications the demand should be quite heavy during the early part of the season by reason of the fact that so much work had to be carried over due to the abnormal rains we have had during the months of August, September and October."

J. A. Rigg,
Acme Limestone Company,
Alderson, West Virginia.

"So far as the local outlook is concerned for commercial business, we do not see a very large program ahead.

"The State of West Virginia has about exhausted its fifty million dollar bond issue for improvement of public roads. Unless the

Legislature in the coming session in the early part of the year should arrange for further financing, road building in West Virginia will be very light during the coming year, with a consequent dull season for the crushed stone industry.

"Other demands for crushed stone, such as railroad ballast and concrete work for building will probably be about normal."

H. E. Bair,
The France Stone Company,
Toledo, Ohio.

"My remarks are limited to the territory comprising Ohio, Indiana, eastern Illinois and Michigan. I believe the crushed stone industry in this section will enjoy about the same amount of business during 1927 as during this year. This takes into consideration road building, railroad ballast, building construction and agricultural limestone. I do not look for any change in business conditions affecting the crushed stone industry during the coming year."

William M. Andrews,
Lake Erie Limestone Company,
Youngstown, Ohio.

"For 1927, the stone producers of western Pennsylvania face a somewhat leaner year. Nearly all of the proceeds of the Road Bond issue have been spent and even if a new bond issue is authorized by the legislature it could not be voted upon until next fall. Then if approved would take a special session of the legislature to make it effective during 1928. This means the bulk of our sales will be in maintenance stone and therefore greatly curtailed production. The ray of sunshine is in the contracts held over from this year on account of the adverse weather conditions.

"Slag competition is growing stronger each year and with the lower freight rates on slag it places the stone producer at a decided disadvantage. We feel all concrete aggregates should bear the same freight rates.

"General business conditions in the past year have been very good. The outlook for next year looks favorable but we do not expect quite as good conditions in all lines as last year."

Hugh Haddow, Jr.,
Menantico Sand and Gravel Co.,
Millville, New Jersey.

"Believing as I do that the sand and gravel industry is only in its infancy, I can only see a continued and steady growth in the future. As for next year only it is my opinion that we may look for a continuation of our good times. During 1926 business had a great year of production, but consumption kept pace so that there was no over-production. This gives a hopeful outlook for the coming year.

"Concrete is becoming more firmly intrenched as a desirable building material and the preparation of suitable concrete aggregates must advance to keep pace with the demands. Our slogan should be, 'More and Better Aggregates,' and those who stress the proper preparation of aggregates can look forward with every hope for good times."

T. E. McGrath,
McGrath Sand and Gravel Company,
Lincoln, Illinois.

"The year of 1926 has been an abnormal one for the sand and gravel producers in Illinois. The production was considerably in excess of the demand throughout the entire season. What's ahead in 1927 for the sand and gravel producer cannot be accurately prophesied at this time. While the demand for building materials throughout this year has been considerably under the demand for the same period last year, still, it seems that a substantial improvement for a prosperous period is in the making. The state officials of the Division of Highways have stated definitely that they will have at least one thousand miles of concrete highways under contract by the beginning of the new season. A road program of the size contemplated by the state for 1927 will naturally have a stabilizing effect on the market and will be a tremendous factor in reviving business generally.

"It is evident that considerable street paving work will be done next year. The domestic tonnage which moves through the downstate retail dealers will be more or less affected by the price level of agricultural products. There is always a large tonnage consumed yearly in the industrial field. Nineteen twenty-seven should be a normal year. Now is the time for the building world to study conditions, to understand them as they actually exist, to price for profit and look to the future with confidence."

J. E. Carroll,
J. E. Carroll Sand Company,
Buffalo, New York.

"The outlook for business in 1927 in our territory is quite optimistic. The State Highway building program will not be decreased below 1926. The County Highway building program, which comprises the territory immediately surrounding Buffalo and the Niag-

ara frontier, will be, if anything, increased over 1926.

"The County is planning to build and widen the main highways leading to the city limits of Buffalo. In some cases they are planning highways from 40 to 60 feet in width radiating north, east, south and southwest from Buffalo. The New York State Highway Department is also planning to widen some of the main highways entering Buffalo to 40 and 60 feet in width.

"The State, County, Town and City Highway Departments are planning to increase the amount of gravel to be used in the construction of highways. Some recent core tests made by the New York State and Erie County Department of Highways on roads constructed this year show astonishing compression tests in favor of gravel in comparison with the use of other hard and semi-hard aggregates.

"The building program which mainly consists of the erection of homes, factories, office buildings, schools, public buildings, etc., will probably not be as lively as it was in 1926. As mentioned in our forecast of a year ago, the building program does not interest us as much as the building of concrete streets and highways. One concrete highway will absorb more sand and gravel than probably 500 or 1,000 small homes.

"Owing to the increasing number of small plants springing up throughout our territory, the business has been split up among many producing firms. In some cases there has been an over-production and prices have suffered accordingly. This will become more apparent in next season's business and we do not look for prices to increase or even keep their present level."

F. W. Renwick,
Chicago Gravel Company,
Chicago, Illinois.

"As usual I am optimistic. There is nothing in sight to indicate any reduction in business development along new construction lines. The most the sand and gravel industry requires right now is a little common sense cooperation on the part of the railroads as carriers, and an ordinary degree of intelligence on the part of the producers, to make healthy business conditions.

"The prospects for our local conditions in Illinois are much better from a road improvement standpoint than they were in 1926, and these in connection with just a normal development program along other lines will practically guarantee a prosperous year's business for the sand and gravel industry, provided they keep their feet on the ground and not make the mistake of attempting either too high or too low prices."

C. H. Young,
Robbins, Young Company,
Minneapolis, Minnesota.

"The producers of sand and gravel in Minnesota have every reason to feel optimistic as regards their business for 1927. Building operations have been below normal during the present year, indications are that there will be more activity in building the coming year and plans are being made for numerous buildings on which work is to begin as soon as the building season opens. Our highway department hopes to continue and enlarge its hard-surfacing program, which with maintenance work to be done will create a demand for concrete aggregates. If they do not experience a car shortage at the time when the demand for their product is greatest, the sand and gravel producers should have a successful and prosperous year in 1927."

Production of Native Asphalt and Related Bitumens

Kentucky, in 1925, maintained its rank among the States as the chief producer of native asphalt, with sales of 286,850 short tons of bituminous rock, valued at almost $2,500,000, according to statistics compiled by the Bureau of Mines, Department of Commerce. Texas, with 204,530 tons of bituminous rock, was second in quantity, a position that it held in 1923 and 1924. As in 1923 and 1924, Utah was the only State to produce bitumens other than bituminous rock, and sales of 39,520 tons of gilsonite and 270 tons of wurtzilite, valued at $767,900 and $18,400, respectively, were reported. An increase in output and in the average value of its products enabled Utah to pass Texas and to resume its rank as second to Kentucky in total value.

Production of bituminous rock, which is used for road building, was reported in 1925 from Alabama, California, Kentucky, Oklahoma and Texas. Missouri, which entered the ranks of the producers in 1924, made no production in 1925. Production and value for the United States in 1925, as measured by sales at the mines, increased 4 and 2 per cent, respectively.

The entire output of gilsonite, used chiefly in the manufacture of paints and rubber substitutes, was from Utah. The quantity increased 10 per cent and the value 27 per cent in 1925. Wurtzilite, sold frequently under the name "elaterite," was also produced in Utah only. This material is used mainly in paints, as a filler for rubber, and in roofing. The quantity produced in 1925 was virtually the same as in 1924 but the value decreased 24 per cent. No commercial production of grahamite and ozokerite was reported in 1925.

CEMENT PLANT DEVELOPMENT

THE real growth of the portland cement industry in America has taken place mostly within the past thirty years. Some small beginnings were made even earlier, which was to be expected since portland cement was first patented a century ago. The first period was that of experimentation with raw materials until a few cement makers found the secret of the production of this material with the raw materials available. Then came a period of introduction. This was devoted to building up the market already conceived by foreign cement makers in order that the early American plants could readily dispose of their product. Next came a period of further develoment, which ended with the invention of the rotary kiln and the development of better grinding equipment. Those two things made possible the production of large quantities of uniform cement at a low cost.

The advantages of this possibility, together with the widened market that resulted therefrom, caused the beginning of another stage, that of promotion. Cement plants sprang up on every hand. Those that were wisely located and properly managed showed a profit, while less fortunately promoted plants were soon absorbed and many brands disappeared from the market. Conditions became such that competition waxed great, and as is usually the case, developed along lines that could not be beneficial to the industry. Then came the era of cooperative promotion, which opened up ever widening markets and gave better conditions for the competitive work of the producers who at the same time cooperated in order to develop further opportunities and justify the investments that had been made in the industry. This cooperation and competition together brought on the concrete age. Other and newer plants came into being, and production shifted from the dry to the wet process.

Then, not so long ago, rumors began to trickle into this country of new and supposedly better portland cements and special cements being produced overseas. Soon our seaboard users found some of these cements offered on the American market in competition with the domestic variety, which had become standardized in accordance with the needs of the field. Not only did foreign special cements come to this country, but even foreign cements roughly corresponding to our own product appeared on the market. Produced with cheap labor and in some cases with equipment unknown on this side, this influx made quite a dent in the market. The special cements themselves got the buyers to talking, and many of them began demanding such cement for special uses.

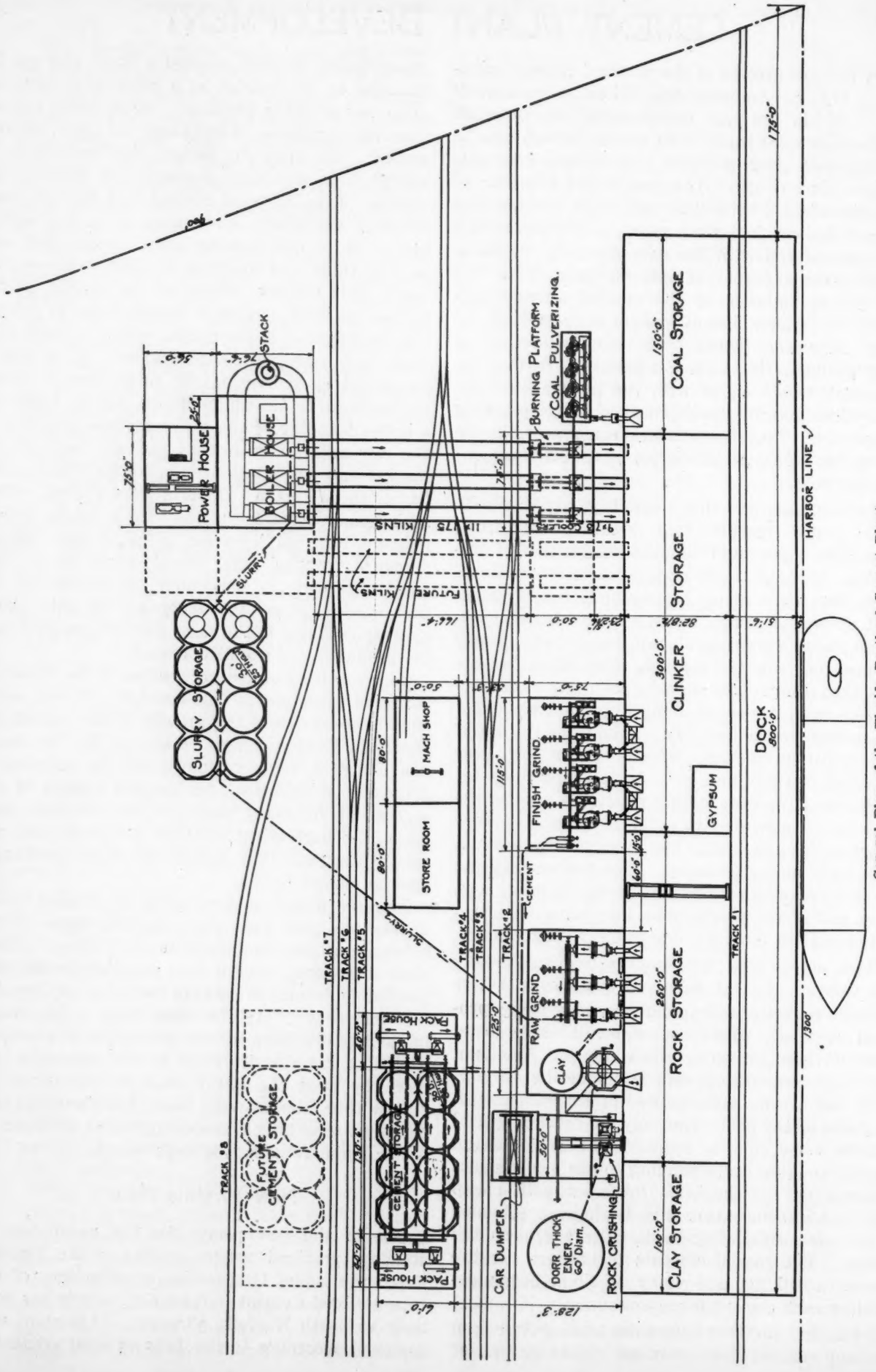
It was then not long before one leading American producer secured the American rights on one of these special cements, erected a plant, and put the material on the market at a price well above the price for ordinary portland. Next came another domestic producer with ideas he had secured abroad. He tried to secure the equipment he needed from American concerns but failed in the search. Then he went abroad and brought back grinding machinery, kilns, and so on, and built a plant. He is now turning out a cement that sells as a portland, but which is of a different composition. This cement, selling on the market at the prevailing price, is said to approximate in properties the behavior of the earlier special cement, with high early strength as the feature. It is said to be gained by increasing the proportion of tricalcium-silicate to dicalcium-silicate, and by achieving a better blending of the slurry by finer grinding in the raw mill. This cement has not been on the market long enough, however, for its ultimate behavior to be known. Reports from abroad, where such cement has been utilized for a longer period, indicate that its behavior is quite like that of standard portland after twenty-eight days. The main difference in hardening occurs during the first week. Since the inception of this plant, another producer in the same district has gone into the production of a similar cement.

So much for the general outline of the situation that has developed in this country. It has paralleled to some extent the growth of the cement industry in Europe, where we already see the abandonment of a single standard, and the adoption of standard specifications for several classes of cements. In Germany there are the standard portlands, the high early strength portlands, and the special cements that cannot be called portlands, such as ciment Londu.

The new plants constructed in the United States during the past year show decided signs of the influence of the conditions outlined above. They show a tendency toward finer grinding, better proportioning, improved burning facilities, and greater fuel efficiency. At the same time a few make immediate provision for the production of a cement that does not restrict itself to the minimum laid down by even the latest standard specifications. All the time, almost every brand has shown a gradual increase in tensile and compressive strength as better manufacturing methods become known.

New Virginia Plant

One of the new plants for the production of standard portland cement is that of the Virginia Portland Cement Corporation, a subsidiary of the International Cement Corporation, which has been built at South Norfolk, Virginia. This plant was designed according to the International standards



General Plan of the Florida Portland Cement Plant

and makes another production unit for the production of Lone Star cement. Naturally the layout took into consideration the local conditions of transportation and the raw materials available. Its capacity is reported to be about 1,200,000 barrels a year. The plant uses marl delivered by water and clay which is delivered by rail. The source of the marl is about twenty miles from the plant. It is excavated by a Bucyrus dragline shovel with a 143 foot boom, loaded on 12 yard standard gauge dump cars which take it to the washing plant on the river bank. Here an installation of Dorr washers and classifiers remove the sand, clay and iron oxide. The purified marl is then loaded on barges and taken to the plant.

This washing plant is of particular interest, since it does not conform to the washing plants usually seen. From a hopper that receives the material from the cars, the marl passes through a William hammer mill and is then conveyed by belt to the trommel of the washer. This is a large circular sieve with half-inch holes, that is partially submerged in the water. Thus it separates and washes during the same operation. Rakes in the classifier then pull the material through the water and up an inclined trough. Further cleaning is obtained at the top of this incline by means of a spray of clean water. This leaves a clean lime that drops into the hopper and is then conveyed by another belt into the barge for shipment to the plant. The clay is excavated by a Browning locomotive crane equipped as a dragline at the pit that is 60 miles from the mill. It is loaded directly into open-top cars and transported to the mill, where it is unloaded by a Link-Belt electric locomotive crane either to storage or to the washmill. Finished cement may be shipped out either by water, rail, or highway.

The plant is located on the Elizabeth river which has a channel 30 feet deep. Wharfage is adequate for any needs of the mill. About 165 men are employed, including the 30 at the marl pit, 3 at the clay pit, and the rest at the mill. The men in the plant work in two 12 hour shifts, while the yard men, the machine shop crew, and the men who unload the raw materials work in shifts of 9 hours.

As the marl is received it is handled by a Milwaukee traveling crane, which takes it to a belt conveyor discharging into bins that feed two number 85 Smidth kominuters equipped with standard rocker feed and a number 15 trix. These kominuters are each driven by a 125 horsepower G. E. super-synchronous motor. The clay is first taken to a number 20 Smidth washmill, where it is made into slurry. The clay slurry is then passed over a coarse screen to remove foreign matter. It is next pumped by Buffalo centrifugal pumps to the clay basins, which are equipped with mechanical agitators, from which it is again pumped by Smidth plunger pumps to the clay feeders over the kominuters. These feeders are of the Ferris wheel type, operating in a trough equipped with an overflow, and are driven by variable speed G. E. motors.

From the kominuaters the slurry is conveyed to the three Smidth tube mills, each driven by a 500 horsepower General Electric supersynchronous motor, and from there to the correcting basins. Three correcting basins, each holding enough slurry for about 500 barrels of clinker, and the three storage basins each holding slurry for 1250 barrels of clinker, are equipped for both mechanical and air agitation. The slurry, containing about 38 per cent of water, is taken from these basins to the kilns by means of screw conveyors and elevators, and is fed into the kilns by ferris wheel feeders.

The clinker is burned in three Reeves kilns, each 220 feet by 8 feet by 9 feet, and each having its own cooler. These kilns are equipped at both ends with air seals devised by International engineers. Powdered coal is used for fuel, and the air for combustion is drawn through the cooler and is warmed by the hot clinker discharged from the kilns. Standard kiln liners are used. Each kiln is operated by an individual 50 horsepower variable speed motor at a maximum speed of one revolution in 50 seconds.

The coolers discharge the clinker into a Smidth shaker conveyor, from which it is elevated to a 10,000-barrel clinker storage. The finish mill contains two Hercules mills driven by 300 horsepower super synchronous motors, and two 7 by 26 feet Traylor tube mills, each powered with a 500 horsepower motor. The clinker is taken from the storage and elevated by an inclined belt conveyor to hoppers feeding the Hercules mills. Cyclone dust collectors are installed in the finish mill. Gypsum is handled by belt from gypsum storage and a table feed delivers the required quantity to the Hercules mills. These table feeds for the gypsum consist of two revolving discs that discharge by means of scraper knives. By adjusting the height of the telescopic feed pipe above the disc, the speed of the discs, and the angle of the scraper knives, it is possible to proportion accurately the right amount of gypsum to clinker.

From the tube mills the cement is taken, by means of Fuller-Kinyon pumps, to the six storage silos with interstice bins, that hold 110,000 barrels. Conveyors and elevators then take this stored cement to bins over the four Bates packing machines that take care of rail deliveries and to the two others that serve the trucks. The packhouse and bag house are equipped with Sly dust collectors. Fuel used in the kiln house is first unloaded from hopper-bottom cars, passed through a Jeffrey single roll crusher, then through the two McKane dryers, and then to the Fuller mills. A spray system washes the gases discharged from the dryers. Electric power is purchased locally. The

power house contains the electric switchboard and the Ingersoll-Rand air compressors. A complete laboratory, machine shop, and blacksmith shop have been provided. The buildings are constructed of steel and cinder block covered with stucco. Production started shortly before the first of the year. Officers of the Virginia company are, H. E. Hilts, manager; Dwight Morgan, sales manager; G. S. Winther, superintendent; and H. A. Williams, chief chemist.

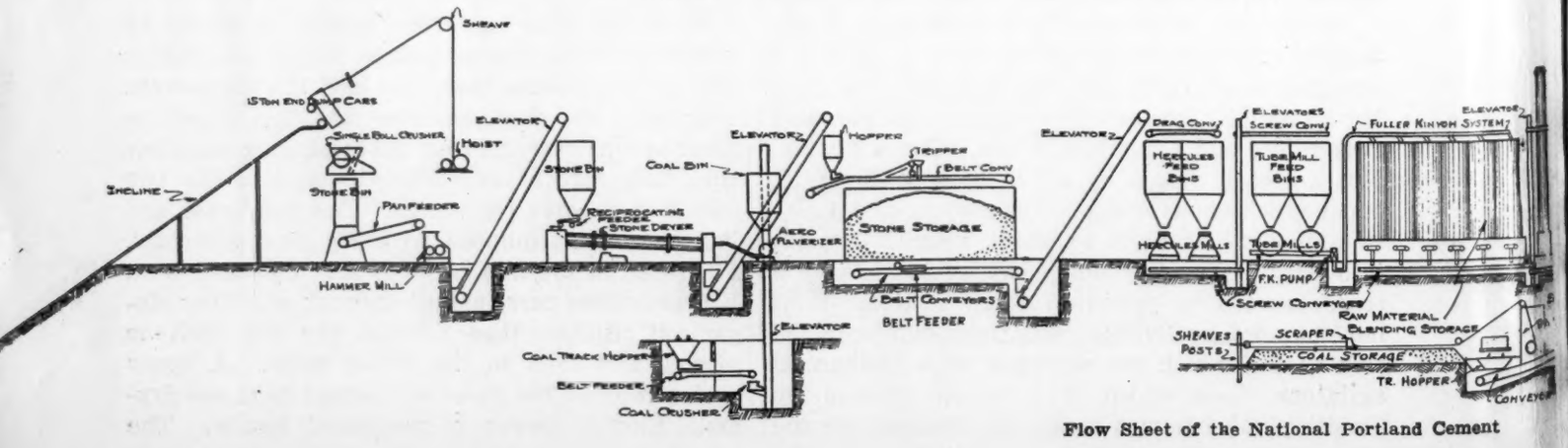
Peninsular Plant Remodeled

The history of the old Peninsular Portland Cement Company plant at Cement City, Michigan, has been one of constant change. When the plant was recently taken over by the new Consolidated Cement Corporation, of which John L. Senior is president, important steps were taken to remodel and modernize the plant. Chief among these changes was the installation of two new kilns and waste heat boilers, together with a highly scientific control system for the latter. Thus the plant was turned into one where the highest economies of of operation are said to be secured. In addition, the operation of this plant is expected to result in learning yet more about the possibilities of future manufacturing methods.

The two new kilns are each 11x175 feet, and replace the three older 205 foot kilns, which will be used from now on merely as auxiliaries. The use of the shorter kilns in connection with a waste heat boiler plant is expected to result in a more efficient utilization of the fuel that is used in burning the clinker, since the gases escaping from the stacks will first have been used as a source of power and should accordingly have been reduced to a far lower temperature than would be possible with simply a long kiln.

It is interesting to know that when the recent adoption of 60 cycle electric equipment was accomplished, several of the original 25-cycle motors installed in 1899 and 1900 were found to be still in use. The new power installation, utilizing the heat remaining in the kiln gases after burning the clinker, consists of two Edgemoor waste heat boilers, one Edgemoor auxiliary boiler, and two 1250 K. W. Allis-Chalmers steam turbines. The installation is of the most modern type in every detail. The building is of steel construction, faced with gunite and roofed with Johns-Manville corrugated asbestos. It is 145 by 65 feet, and has a 111 by 20 feet wing. This provides amply for increasing the capacity of the plant at a later date, since there is room for a third turbine. The two waste heat boilers are so arranged as separate units that any desired hook-up may be easily secured. Each has 9000 square feet of heating surface and is equipped with a Foster superheater and economizer. They are of the four-pass type with 330 tubes, each 25 feet long and 4 inches in diameter, and are designed to work at 225 pounds per square inch working pressure. The super-heater has a guaranteed rise of steam temperature of 150 degrees Fahrenheat when the unit is producing steam at the rate of 22,500 pounds an hour. The economizer has 3,885 square feet of heating surface.

Of great importance in this installation is the instrument panel that gives a most thorough flow of information on the operation of the unit. It gives a complete record of both draft and temperature at all stages between the kiln and the turbine, while electric pyrometers connected to the main panel board enable the operator to detect any variations from the proper operating conditions and show any leak in the boiler setting or accumulation of dust on the flues. The instrument board contains nine instruments. A Bailey indicating draft gauge records the pressure of the kiln gases at six different points between the kiln housing and the exhaust fans. Two Bristol recording draft gauges show the draft in the kiln housing and in the flue leading to the exhaust fan. A Brown indicating pyrometer gives flash reading of the temperature of the gases entering the boiler, leaving the superheater at the bottom of the first pass, at the bottom of the second and the third passes, and at the bottom of the fourth pass over the economizer. Two Brown recording pyrometers record the temperature of the gases leaving the kiln housing and in the flue leading to the exhaust fan. The Brown



Flow Sheet of the National Portland Cement

indicating thermometer records the temperature of the superheated steam at the superheater outlet, the temperature of the water leaving the economizer, and the temperature of the water entering the economizer. Two Bailey steam flow meters record and integrate the steam flow and record the steam pressure between the boiler and the steam header, and between the steam header and the turbine.

Control flues are so arranged between the kiln and the boiler that any combination of operation is possible. Either one or both boilers may be operated from either one or both kilns. A common flue, 7 feet high and 22 feet wide, running the entire width of the boiler house and connecting with the natural draft stack, receives the gases from the kilns and passes them to the boilers. Dampers at each kiln and gates at each boiler afford the control. The natural draft stack is of reinforced concrete, 157 feet high and 10 feet in diameter at the top. The auxiliary boiler is also connected to this stack. This auxiliary boiler, which is used for starting and shutting down the plant, is an Edgemoor water-tube boiler with 3,477 square feet of heating surface on 122 tubes, and is equipped with a McClave-Brooks shaking grate. It, and the air compressor, are located in the wing of the power building. Induced draft is supplied to each waste heat boiler by an individual exhaust fan of the paddle wheel type built by the Green Fuel Economizer Company, and driven by a 150 horsepower Allis-Chalmers slip ring motor. Exhaust gases discharge through a 72 foot concrete stack. Since constant draft is afforded entering the kiln, it is up to the boilerroom crew to afford proper kiln operation.

The turbines have a capacity of 1250 K. W. and an 80 per cent power factor, and are of the reaction three-stage type with bleeder connections for heating purposes. The generators are 3-phase, 2300-volt, 60 cycle, and are equipped with Griscomb Russel air coolers. When they are operated at a 100 per cent power factor, the maximum capacity is 1560 K. W. each. Pitting of boiler tubes is minimized by deaerated water furnished by an Elliott deaerating heater. F. E. Dodge, chief engineer of the Cowham Engineering Company, designed and had charge of the construction of this plant, P. E. Curtis is superintendent.

National Plant at Quebec

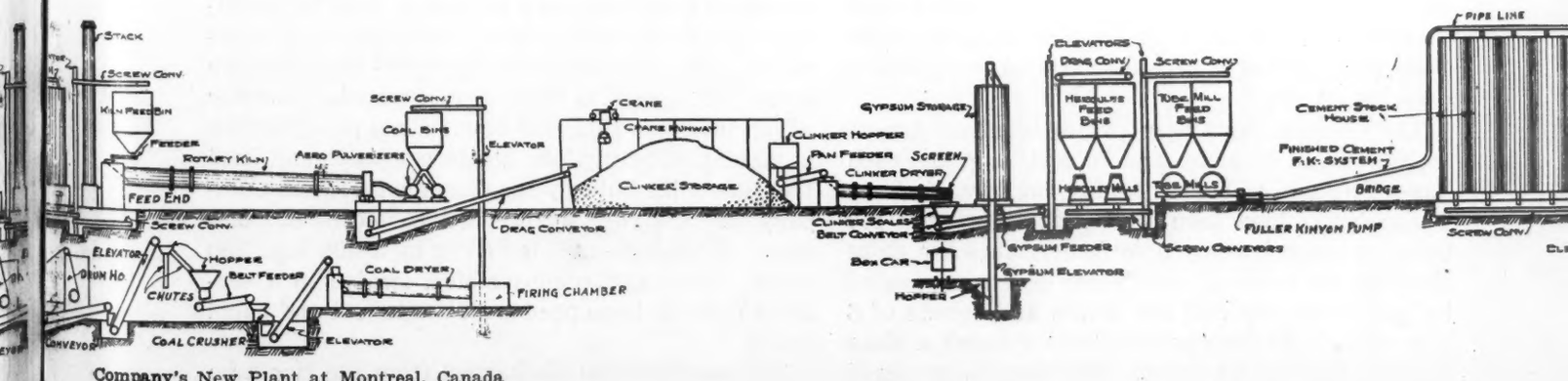
Just over our northern border, near Montreal, is the new dry process plant of the National Cement Company, where first shipments were made last February, although but two of the three kilns were then in use. This plant has now a capacity of 3,000 barrels of cement each day, and is so laid out that its capacity may be increased to double that amount at any future date, and without shutting down any department to make the desired additions, It is located about 11 miles from the center of Montreal, about, one mile from the No. 1 mill of the Canada Cement Company, and is served by the Montreal Tramways and the Canadian National Railways, and by an improved highway, thus facilitating both local and distance shipments. In addition a rail connection to the St. Lawrence River, a little over a mile away, provides for the receipt of coal and gypsum and the shipment of cement by water. Thus great port facilities are easily available.

The plant utilize the dry process because of weather conditions that would make the wet process expensive, and because the cement rock available in the quarry is of the ideal mixture in the deposit, requiring no addition of calcium carbonate as is required in the Lehigh district. The quarry is simply worked to a 45 foot face, to get the right mixture, the rock is hoisted to the mill, crushed, blended, and pased through the kilns without the use of any second raw material. The average analysis of this cement rock has been reported to be as follows:

Silica	14.28%
Iron Oxide	1.82%
Alumina	5.48%
Carbonate of Lime	75.39%
Carbonate of Magn.	3.15%

Variations in the composition of the deposit are taken care of in the raw mill by the use of a battery of blending bins.

The quarry is worked by first drilling with a Sanderson Cyclone, Type 14,6-in. electric traction well drill, after which the face is shot and the rock



Company's New Plant at Montreal, Canada

loaded by a number 50-B Bucyrus electric crawler-tread which is equipped with a 1¾ yard Bucyrus dipper. This shovel operates on direct current and is equipped with its own motor generator set. The shovel loads directly into 15-ton end dump cars and these when loaded are hoisted up an incline to the mill. The hoist in the stone house now furnishes all the power that is needed in moving these cars since the face is so close to the incline. This hoist is a heavy duty single drum Flory outfit, 54 inches in diameter and 36 inches long, equipped with a 350 horsepower motor, and having both a motor brake and power brake and a Royer over-winding and over-speeding device. The operator's cage, enclosed in glass, is located in front of the crusher building. Here the operator can take care of the hoisting and observe the crushing operations. Push buttons are located at several points in order that the crushers may be instantly stopped whenever this may be necessary. The cars are dumped automatically by means of a very simple device. As the car approaches the dumping point, a pair of wide gauge wheels at the rear of the car engage a pair of rails placed outside and at a steeper pitch from the main track, tilting the car. At the same time the bail, attached to the cable, pulls up and opens the door of the car, allowing the material to fall into the hopper that serves the crushers.

The primary crusher is a 36 by 60 inch Pennsylvania single roll crusher, which is belt driven from a 200 horsepower, 600 r. p. m. motor. It is provided with a hopper of steel plates armored with rails, which has a hinged back shield that may be let down to form a platform for convenience in making repairs. Here the stone is crushed to 8 inches and under, and is then dropped into a hopper, from where it is taken by an apron feeder to the secondary crusher.

This latter is a Pennsylvania SX-12 hammer mill, which is driven by a direct connected 300 horsepower 750 r. p. m. motor. The apron feeder is belt driven from the shaft of this crusher. Here the material is reduced to a maximum size of 2 inches, and is discharged to the boot of a bucket elevator, which takes the stone to the bins over the dryers. This crushing plant has a capacity of approximately 250 tons an hour, which is sufficient for a 6000 barrel plant. A Morris overhead hand operated traveling crane, of ten tons capacity, facilitates the removal of crusher parts to the machine shop for repairs.

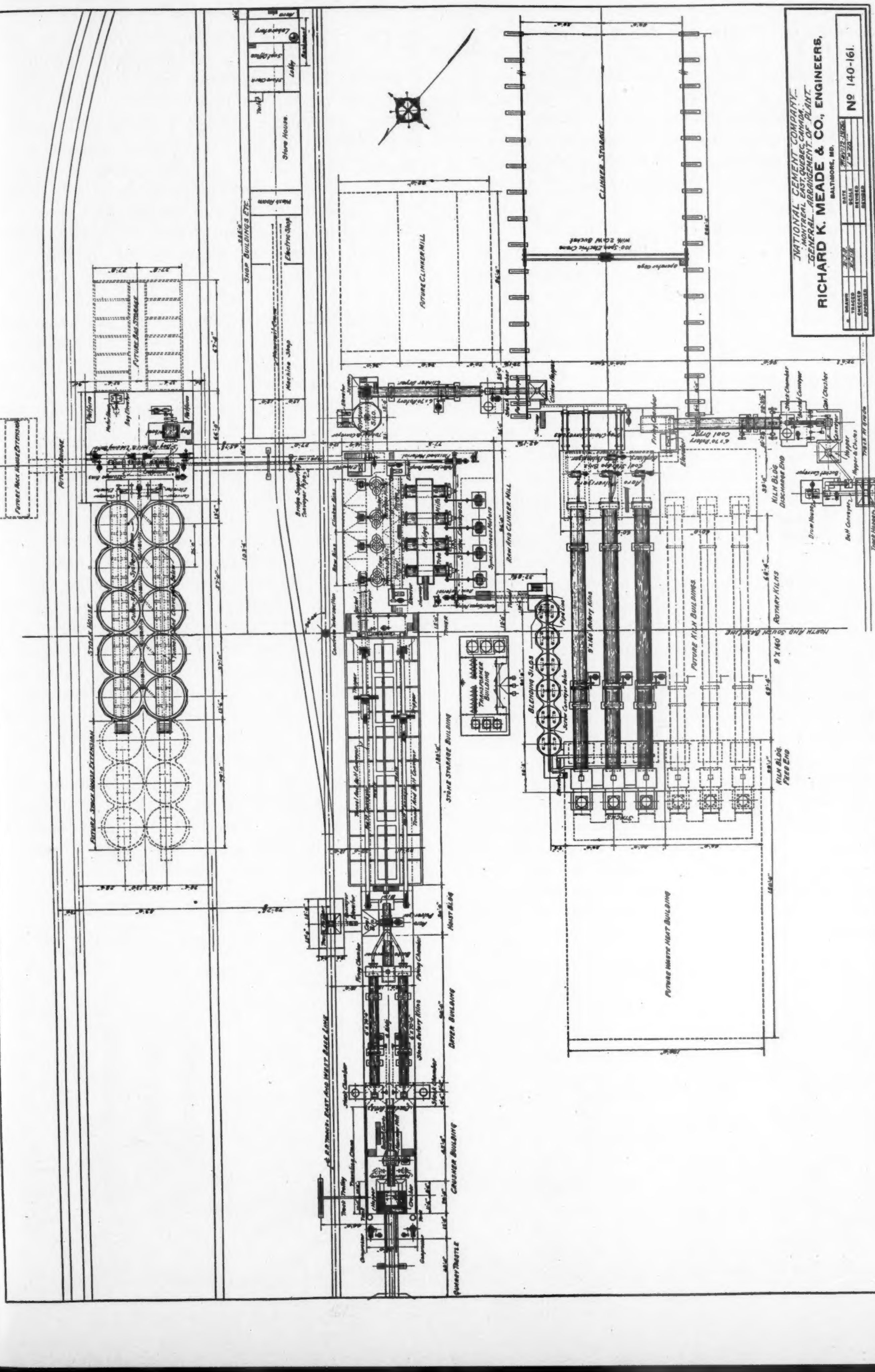
The crushed stone next passes into two dryers, each 6 feet in diameter and 70 feet long, and each has a feed bin to supply a uniform flow of stone. These dryers have each a working capacity of 150 tons. A reciprocating table feeder takes the stone from the bin to the dryer. These dryers are heated by pulverized coal and are driven at the rate of 3 r. p. m. by a 30 horsepower motor through a Hans Renold silent chain drive. The fuel is prepared and blown into the furnace of the dryer by means of an Aero pulverizer, size D, which supplies both dryers through a Y connection with a deflecting plate valve. This pulverizer is driven by a direct connected 40 horsepower 1200 r.p.m. motor. The coal for the pulverizer is delivered on a track alongside the dryer building, and is discharged into a concrete hopper, fed from it by a belt feeder to a bucket elevator which is equipped with a magnetic pulley. The dried stone is loaded into the reinforced concrete stone storage, which is 45 by 150 feet and divided into two bins, one of which is filled while the other is being emptied. The storage of dry stone was considered more feasible since stone as it comes from the quarry is much more likely to freeze in winter. Each storage bin holds enough material to run the plant for three and one half days, or 3000 tons, thus insuring a uniform supply.

This stone storage is filled by means of a bucket elevator that receives the material from the coolers, and discharges onto two 24 inch belt conveyors, each 160 feet long, which operate in the roof of the stone house. An automatic tripper on each belt so distribute the stone that the bins hold a supply of uniform composition.

As rapidly as it is needed, the stone is taken from the storage through two tunnels running lengthwise under the bins, and these tunnels are equipped with two automatic feeders mounted on trucks, which may be spotted underneath any discharge spout. These feeders discharge on two 16 inch belt conveyors, one for each tunnel, each equipped with a magnetic pulley to guard against tramp iron. These feeders are driven by a small motor which may be plugged in to any of the several outlets provided on the tunnel walls. The belt conveyors are each driven by a 7½ h. p. motor.

The material from the stonehouse is next elevated by a 24 inch inclined bucket elevator to the bins that serve the Bradley-Hercules mills. The raw mill and the finish mill are together in one room. Here are four Bradley-Hercules mills, each driven by a 350 h.p., 400 r.p.m. motor and direct connected to the mill by a DeLaval coupling. Two of these mills are designed for grinding clinker and two for the raw material. They are so arranged that three may be readily used for grinding either raw material or clinker if the work so requires. Sixteen-inch screw conveyors transport the output of these mills to the foot of a bucket elevator which feeds the tube mill bins. Final pulverization is accomplished by four single compartment 7x26 feet tube mills built by the Canadian Vickers Company and designed by Richard K. Meade & Company. Each tube mill is driven by a 500 h.p., 180 r.p.m. super-synchronous motor, located in a separate room and equipped with exciter set and panel board.

The raw material discharged from the two tube



General Layout of the National Plant at Montreal

mills assigned to that work is collected in a screw conveyor and taken to a Fuller-Kinyon pump system that delivers it to six reinforced concrete storage silos. Here the composition of the material is checked by the plant chemist and the contents of several bins are blended if necessary to give a uniform product. This gives the same close control of the raw material in a dry process plant that is one of the usual special advantages of the wet process. Each silo is 43 feet high and 15 feet in diameter, and holds 170 tons of material.

Feeders under four openings in the bottom of each silo deliver material to a screw conveyor, which in turn feeds a second screw conveyor leading to the kiln feed bins. Elevating is done by a bucket elevator. Raw material may also be taken directly from the tube mills to the kilns without the intermediate handling if desired.

There are three Vulcan rotary kilns, each 9 feet by 160 feet, pitched at ½ inch to the foot, and each operated by a 50 h. p. constant speed motor through a silent chain drive. A special worm feed brings the material into the kilns. Provision is made for later installation of waste heat boilers. Green fire brick lining is used. Pulverized coal is the fuel used, and this is supplied by an Aero pulverizer which pulverizes the coal and blows it into the kiln in one operation. A fourth pulverizer is mounted on a truck and kept in reserve. This can be connected in place in a few moments time.

Coal for burning is dumped from the cars into a truck hopper, delivered by belt feeder to an elevator with two discharge chutes. One delivers the coal into a pile for further handling to storage, while the other discharges into a concrete pit, thence by belt feeder to a 36x24 inch Pennsylvania single roll coal crusher, from which it is elevated into a 6x70 ft. rotary dryer, otherwise the coal is distributed to a storage by a dragline scraper, which later reclaims it for crushing and drying. The dryer is direct fired, and is intended for use only when the coal contains more than 10 per cent moisture.

Clinker is taken from the kilns by three Rex drag chains which operate in troughs lined with chilled iron plates. These chains carry the clinker to storage, which is further cared for by a five ton Shephard crane handling a two yard Hayward bucket. The clinker storage is 100 by 240 feet, and holds 250,000 barrels of clinkers. Clinker is reclaimed from storage by the crane, which discharges it into a concrete hopper above a 6x70 feet dryer. This dryer mainly functions as a conveyor, but when the clinker proves wet, it is dryed therein by mixing with it a portion of hot clinker. The clinker then discharges into automatic scales, at which time the gypsum is added through smaller automatic scales. Gypsum, which has been first crushed to 1 inch and under, is stored in a concrete silo, 15 feet in diameter and 45 feet high, directly over the proportioning scales.

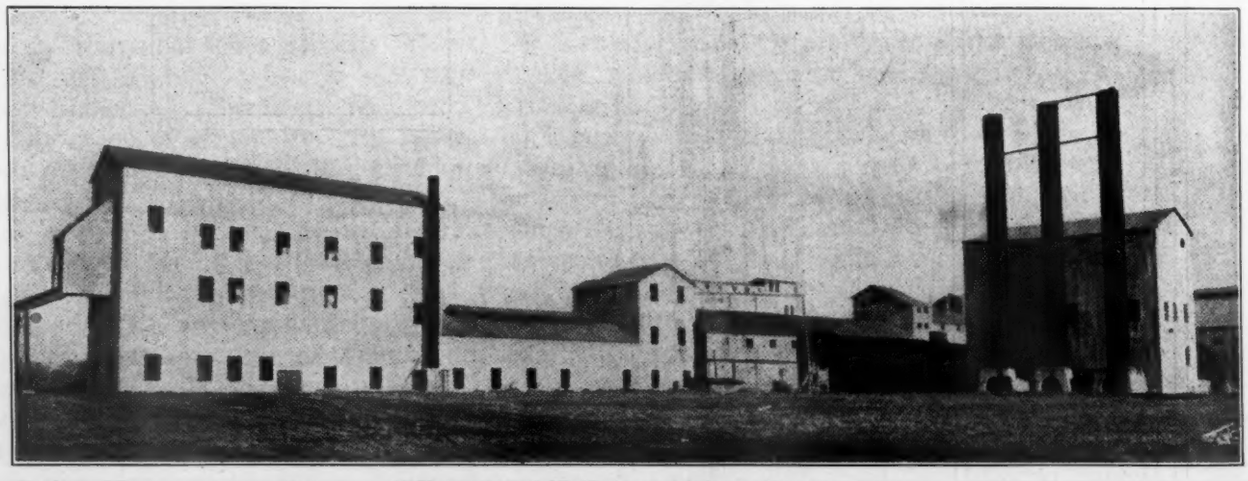
The clinker next discharges onto a 24 inch belt conveyor, is taken to a bucket elevator, is lifted, then taken by drag chains to bins above the Hercules mills. Here it is crushed, then taken to the tube mills for final grinding, and then pumped to the stock house by a Fuller-Kinyon system.

The stockhouse consists of ten reinforced concrete silos 25 feet in diameter by 75 feet high, with interstice bins, all holding about 110,000 barrels of cement. Screw conveyors beneath the bins take the cement to the bins over the Bates valve bag machines, where the product is prepared for shipment. The bag cleaning department is above the packing room, so that cleaned and mended bags are chuted directly to the racks beside the packing machines. Sacked cement is loaded directly into cars or trucks for shipment.

This plant was designed and built under the supervision of Richard K. Meade & Co., Baltimore. Joseph Versailles is president, W. R. Oglesby is superintendent, Joah Etchells is Chief Engineer, and W. A. Wolf is chief chemist.

Where Miami Cement is Made

Although not a 1926 plant, but rather having



View of the New National Plant at Montreal

been completed during 1925, no information was made available for publication until about a year after the first cement was shipped. Thus, no review of the progress made during the year would be complete without mentioning the new plant of the Southwestern Portland Cement Company, at Osborn, Ohio, where the special portland cement known as "Miami" is produced. The plant is of particular interest since special foreign equipment was obtained and installed in order that a cement might be produced that could be sold as a portland cement at current market prices and yet excell the standard portland cement in the rate of hardening during the first week. After a year of operation the cement is still selling at the prevailing mill base, and tests show that tensile strengths of about 500 pounds per square inch at seven days when the strength at 28 days is about 550 pounds. In other words, the strength relation might be expressed by a formula approximating $f_{28} = f_7 \times 23.9$ where f_7 represents the strength at 7 days and f_{28} the strength at 28 days. The initial set occurs in 2 hours and 11 minutes, while final set occurs in 4 hours and 22 minutes. Thus, this cement, which appears to comply with the usual definition for portland cement, may be handled just as is the standard variety, yet it gains strength so rapidly that forms may be stripped at a much earlier period, or traffic may be turned on the road just that much sooner. Such properties have attracted the attention of many cement users and have resulted in a capacity business for the plant. It is but natural that information regarding the plant used at Osborn should prove of interest, regardless of ideas that the mill operator may have on this subject of special cements.

The plant employs the wet process and has a present capacity of 4,500 barrels, with provision made for expansion to 6,000 barrels. The use of well planned reinforced concrete structures, together with the absence of dust because of the use of efficient dust collectors, gives the plant a very attractive and neat appearance.

The quarry is electrically operated. Drilling is done by two electrically driven Loomis clipper drills, while the digging is accomplished by one 1.8 cubic yard Marion No. 37 electric shovel, full revolving, which requires the service of but two men instead of the five men that would be needed if a steam shovel were used as in the beginning. Since the electricity is produced at the plant by means of a waste heat boiler installation, the power cost is practically nil. The quarry is about a mile and a half from the mill, so the rock must be transported by means of dump cars on a standard gauge railway. The quarry face is about 1600 feet long and 35 feet high. The stone is hauled in 12 ton Koppel cars, 36 in number, and motive power is supplied by three 52 ton Vulcan side rod locomotives and one 56 ton Shay geared locomotive. Shale comes by rail from Zanesville, which is about 60 miles away.

The raw materials are thus brought to the plant and are dumped into hoppers for further treatment. The cars are first spotted on a siding placed on a trestle by means of 1¼ inch cable operated by a Thomas single drum hoist, gear connected to a 50 h. p. motor. An overhead hoist then tips the cars, causing them to discharge their loads into the desired hopper. The quarry size rock is crushed in one of two special hammer crushers to one inch or one and a half inch size. These crushers, which will each handle up to 250 tons of rock per hour and reduce it to tube mill size in one operation, are each operated through two shafts by two 100 h. p. motors connected through Cutler-Hammer magnetic clutches. An ingenious arrangement permits either or both crushers for either rock or shale, and the delivery of the resulting tube mill material either to storage or to the raw mill bins as desired. A feature of this installation is a shuffler conveyor that has proven to be quite economical for such service.

Raw mill storage is 400 feet long by 100 feet wide. The entire area is used, and materials are moved from this storage by an 8 ton P & H crane which uses a 150 cubic foot Blaw-Knox "Speedster" bucket. Raw and finish mills are combined in the same room, with all mills and motors carefully set to line. Since that element is considered of prime importance to the process, the most careful attention is paid to raw grinding, and all material leaving this department must be so fine that 92 per cent will pass the 200 mesh screen. Thus a more intimate association of materials is thought to be afforded in the kiln.

Five mills provide for raw grinding and four are used for the clinker. All raw mills, one clinker mill, the hammer crusher, and the shuffle conveyor are reported to be of foreign manufacture. The raw mills are of the 3-compartment type and are 26 feet long, with the first compartment 7 ft 6 inches in diameter and the second and third compartments are 5 feet 11 inches in diameter. The corresponding finish mill is 40 feet long. Each has a capacity of 50 barrels an hour, and reduces 1½ inch stone or kiln product to the proper fineness. The two other mills in the finish department are ordinary 7 feet by 26 feet Allis-Chalmers compeb mills. The raw mills are driven by 400 h. p. synchronous motors through Cutler-Hammer magnetic clutches, while the finish mills are driven by 500 h. p. motors. Revolving disc feeders operated through James speed reducers by 2 h. p. motors make for accurate volume of material fed into the mills. As the shale enters the mill, 55 per cent water is added. Leaving the raw mill the shale is pumped to slurry tanks above the other three raw mills by a 6 inch Wilfley centrifugal slurry pump, and is fed to the raw mills through a six inch pipe line.

After leaving the raw mills, the slurry is drained into an underground slump, from which it is pumped by two special airlift pumps to the blending and storage tanks. These reinforced concrete tanks, 15 in all, are 23 feet in diameter and 37 feet deep, and are arranged in three rows of five tanks in each. Each has a capacity of 1200 barrels, and is equipped with an agitator. The first two rows are used for blending.

A feature of the kiln installation is the enlarged burning zone with which the kilns have been provided. This follows a practice that has come into favor among the European producers. Three kilns have been installed, two of which were built by Allis-Chalmers and the other by Traylor. These kilns are 175 feet long and ten feet in diameter except for the burning zone, which is 11 ft. 6 in. in diameter. Full seals at both ends make for accurate burning and an increased heat at the head end. Draft is provided by the waste heat boiler fan.

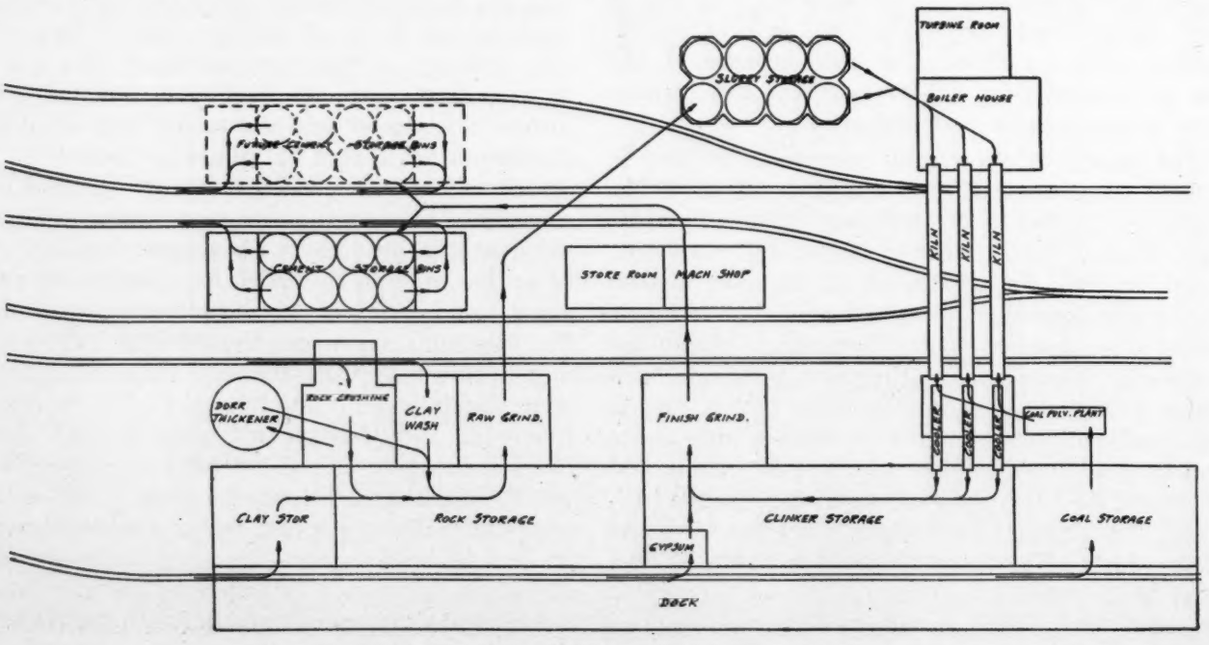
The coal room is worth seeing. Here a Clark dust collecting system is installed in each dryer and mill so that almost all dust is reclaimed and put to use instead of being blown over the department. Fuller Lehigh Randolph dryers are fed by gravity from raw coal storage bins after the coal has first been pulverized, and these bins are fed by two Fuller-Kinyon 8 inch pumps from the pulverizers. Automatic control and manual control are both provided for this system.

All power for operating purposes is generated by means of 3 waste heat boilers of 1050 h.p. manufactured by Babcock & Wilcox. They are equipped with Green fuel economizers and Diamond soot blowers. Exhaust fans are operated by 100 h.p. variable speed General Electric motors. Gases drop in temperature from about 1200 degrees Fahrenheit to about 350 degrees Fahrenheit in passing through the boilers. Steam is generated at 225 pounds, with 150 degrees of superheat. This is turned into power by means of a 3000 k. w. and a 1500 k. w. turbine generator supplying 3-phase, 60-cycle, 2200-volt current.

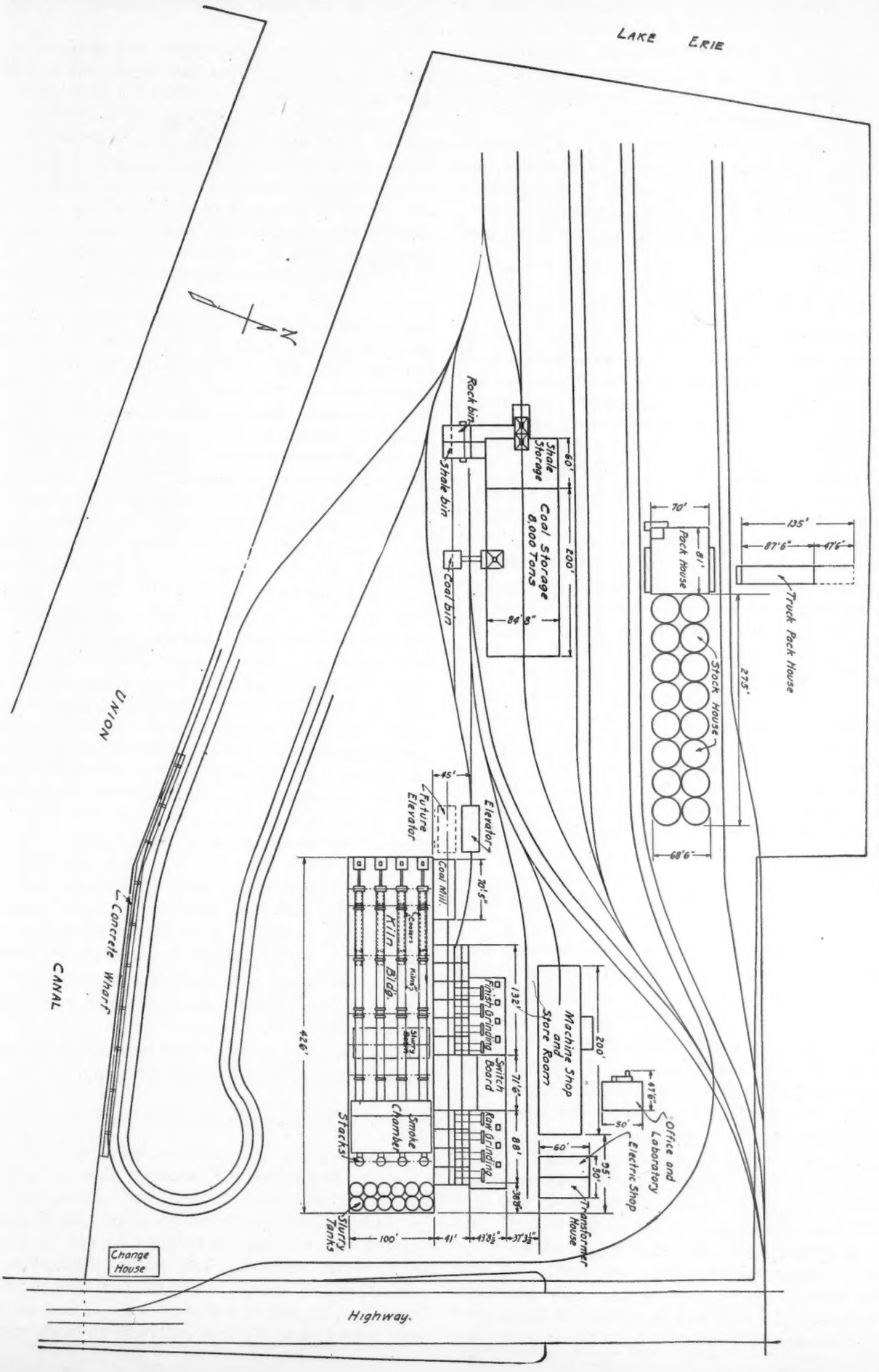
A separate dust precipitation system of the Cottrell type, furnished by the Western Precipitation Company, and installed in a separate building, reclaims the dust that would otherwise go up the stack. This not only saves valuable material, but prevents that dust from ruining the surrounding landscape.

After leaving the kilns the clinker passes through three Vulcan coolers, then onto "torpedo" conveyors to clinker storage. These discharge the clinker either to general storage, to clinker storage tanks, or direct to the finish grinding department. A similar conveyor transports clinker from the silos to the finish grinding department, while another takes the clinker from one of the elevators. Three concrete silos are used to store clinker, each 50 feet in diameter and 67 feet high, and the total capacity is 90,000 barrels. Space between them provides a three months' supply of gypsum. Gypsum is added to the clinker as it passes over the torpedo conveyor to the finish grinding department.

Two 3-inch Fuller Kinyon pumps take the finished cement to the silo storage. This is comprised of 10 silos, each 80 feet high, together with 14 interstices, which provide a storage capacity of 250,000 barrels. An arrangement of screw conveyors, rotary screens, and Fuller Kinyon pumps pass the cement from the silos to the packers. There are six packers in all, of the 3-spout Bates type. Four are in one room and are equipped with belt conveyors. These provide for rail deliveries, while the others are in a separate room and take care of the local business that is served by trucks.



Flow Sheet of the Florida Portland Cement Plant



General Layout of the Great Lakes Portland Cement Plant

An unusually complete laboratory has been installed, to afford control of production and another to do routine tests for customers. Prominent in one laboratory is an experimental cement plant equipped with a 23 foot kiln. This miniature plant is devoted to research activities.

Carl Leonardt is president, and F. H. Powell is secretary and sales manager of the concern, and are located in Los Angeles, while W. T. Groner is superintendent, R. R. Coghlan is chemical engineer, and C. D. Clugston is sales manager of the Osborn plant.

Great Lakes to Produce Lehigh Cement

Another wet process plant, of greater capacity, that was built during 1926, is the new Buffalo plant of the Great Lakes Portland Cement Corporation, of which Adam L. Beck is president. This plant, according to an operating agreement with the Lehigh Portland Cement Company, will produce Lehigh cement, with a capacity of 7,000 barrels a day. Provision for expansion to 10,500 barrels when required is being made. The plant is ideally located to permit shipment of cement by water to distant markets and by truck to the local trade, since it is situated on the Union canal between Lake Erie and the highway that runs between Buffalo and Cleveland. About thirty acres are available for plant purposes. Rail transportation by eleven steam roads through switching facilities as well as by two electric railways complete the unusually good transportation facilities. A local market of one and a half million population within a 35 miles radius will be served by truck deliveries direct from the mill, for which a special packhouse is being provided. Ninety carloads of cement for rail transportation can be handled each day, in addition to the loading of six trucks at a time with only five minutes being required for the loading of each truck. This is to be made possible by means of automatic loading equipment.

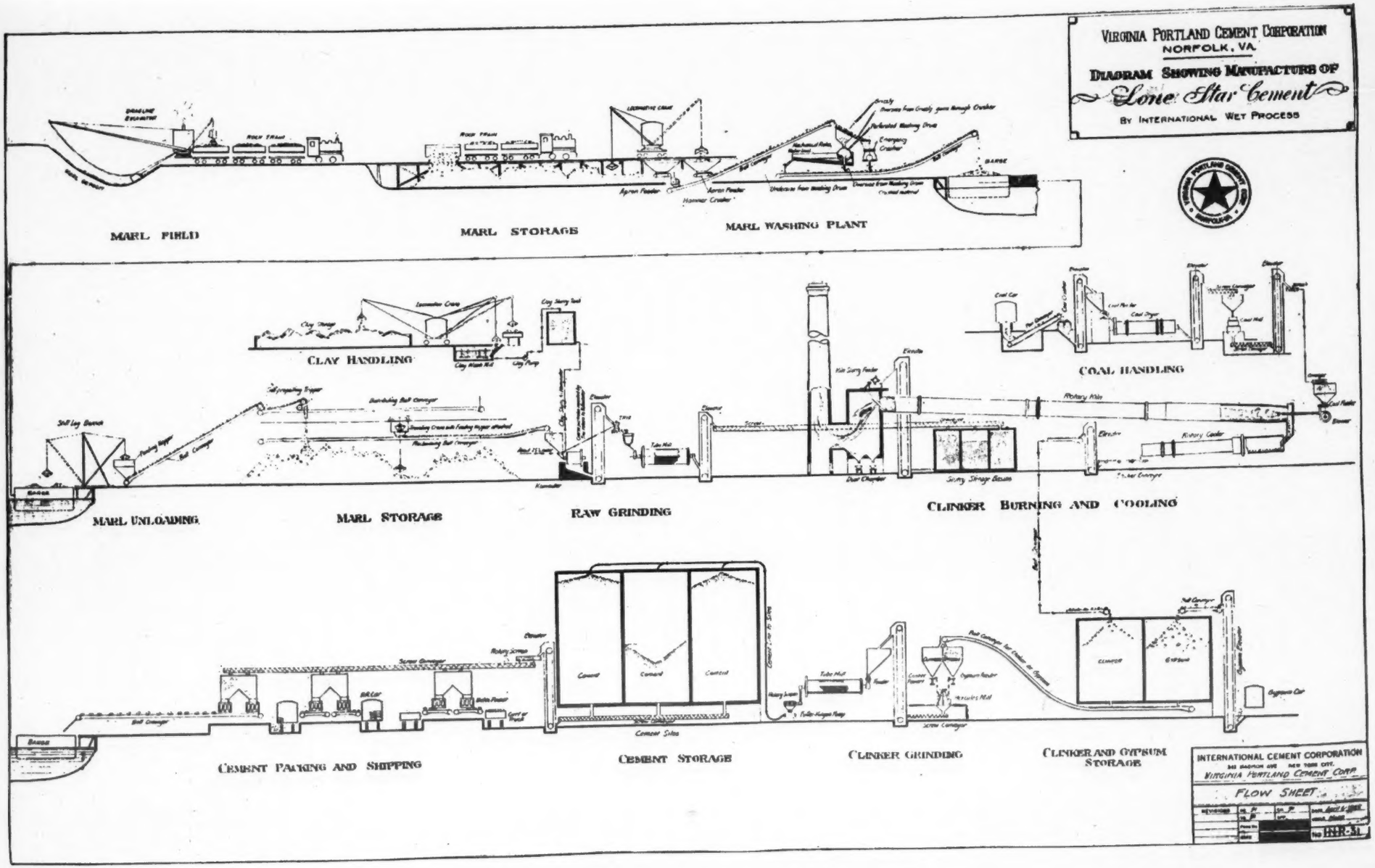
The raw materials used will be limestone purchased for the purpose at Rogers City, Michigan, and shipped by boat, and shale and clay from the company's own pit about eight miles from the mill to be shipped by rail, gypsum from the Oakfield district 22 miles away, and coal from the Pittsburgh district. Although stone will be ordinarily dumped directly into bins above the raw mills, extra storage has been provided in the open alongside the dock, while clay and shale will be stored in a 60 by 85 foot building holding 3,800 tons, and coal in a 200 by 85 foot building which will hold 8,000 tons. Gypsum is to be placed directly into bins over the finish grinding mills, where three weeks' supply will be kept on hand. All raw materials will be of compeb mill size when delivered, since the rock will be crushed at the quarry and the shale will be prepared in a Dixie pulverizer at the storage plant before it is taken to the raw mill.

While in other departments this plant is quite like others, yet the initial handling of the materials is an innovation and quite unlike the methods ordinarily observed. Four motorized electrically operated dump cars and two trailers made by the Atlas Car & Manufacturing Company, are utilized for hauling the materials in the plant yard. These are loaded at the dock or at the siding, or in the storage department, take the material to an elevator, are lifted to a service track above the bins, and discharge the material directly into one of the bins serving the raw mills. Four bins for rock and four for shale serve the four mills, and hold enough material for 24 hours of operation. In the raw mill, the rock and shale feed directly from these rectangular concrete bins into the four 8 by 30 ft. Allis-Chalmers compeb mills, which are operated by direct connected 800 h. p. super synchronous General Electric motors. Thirty-one per cent of water is added to the material at these mills, thus making the slurry. This slurry then is pumped by Wilfley centrifugal slurry pumps, to the slurry basin and 12 slurry tanks each 15 feet in diameter by 40 feet high, where it is blended. It then goes to the 6,000 bbl basin under the four 11 by 250 foot Reeves kilns in which it is next burned, then through the four 9 by 90 foot Reeves coolers, and from there to clinker storage. From storage, the clinker is conveyed to the finish grinding department, where the gypsum is added and the clinker is ground into cement by means of another four 8 by 30 foot three-compartment Allis-Chalmers compeb mills, which are operated by the same kind of 800 h. p. motors as are the raw mills. Fuller-Kinyon pumps then take the cement to the stock house, and from the stock house to the packing department. Sixteen silos with seven interstice bins hold the bulk cement. These silos are about 33 feet in diameter and 80 high, and hold 350,000 barrels of cement. Coal storage is 200 by 8 feet, from which the fuel goes to four Fuller-Lehigh waste heat dryers and is then discharged into Raymond pulverizers, and is then carried by air separators and screw conveyors to the kiln feed bins.

This plant was designed and built by the Burrell Engineering and Construction Company.

Cowham Builds Florida Plant

Another plant designed and being built by the Cowham Engineering Company, shows features that are of the most modern type. Provision will be made for the use of either oil or coal burning. Cement will not only be shipped by rail or water to domestic markets, but water shipments of cement will be made to other countries as well. This plant, located on a 25 acre tract of land on the coast near Tampa, Florida, will have an initial capa-



Flow Sheet of the Virginia Portland Cement Plant at Norfolk

city of 1,500,000 barrels of cement a year, with provisions made for future expansion. The layout is unusually compact, and good economy of operation is expected. The location provides not only convenient location to one of the greater cement markets of the state, but makes possible adequate housing possibilities for employees, which is quite a problem at some plants. The plant is served by the Tampa Northern railroad, whose main line is about two miles from the plant. All Florida of importance is within 200 miles of the site.

Raw materials are to be secured from deposits about 40 miles to the north, on the Tampa Northern Railroad. About 600 acres of limestone and clay lands have been secured, affording a supply sufficient to make about 160 million barrels of cement. The limestone is of the Tampa formation, with a face of about 75 feet. Coal will be secured from the Tennessee or Alabama fields, or oil will be used from the oil fields of southern Texas. Materials will be hauled by rail in standard gondolas and discharged into a pit by means of a revolving tipple. This pit will hold more than enough material for a day's operation.

A travelling crane equipped with an orange peel bucket will take the stone and clay from this pit and dump the former into a 36 by 60 inch Fairmont crusher, while the clay will be dumped into a 26 foot washmill. The crusher, which will be elevated, is to discharge into a revolving screen. The rejections from this screen will be further reduced by a No. 5050 Dixie Mogul swing hammer mill, and will then rejoin the finer material and be spouted directly to storage.

The main storage building is to be 800 feet long, and over 82 feet wide. Located alongside the dock, this structure will provide for receipt of materials by water if desired, and will hold all the materials to be used by the plant. Of this space, clinker storage will take about 300 feet of the length of the structure, and will provide for about 150,000 barrels of clinker. Rock storage will be 250 feet long, with a content of 20,000 cubic yards, while the clay section will be 100 feet long, with a capacity of 7500 cubic yards. Coal will be stored in a 150 foot section at the opposite end from the clay storage, and will provide for the storage of 7500 tons. Two traveling cranes with clamshell buckets serve this building.

The three kilns will run at right angles to this building, and will discharge clinker from the coolers directly into clinker storage. Ordinarily the clay room will be used only for a reserve supply, since current needs are anticipated by deliveries to the clay pit and washmill.

The raw grinding department will contain three number 8726 Allis-Chalmers wet grinding compeb mills. Stone will be delivered from storage to bins above these mills, while clay slurry will be pumped from the storage tanks. Proportioning will be done before the material goes into the compeb mills. From these, the slurry will go to storage tanks, where blending can be accomplished.

The kiln department contains three 11 by 175 foot rotary kilns, and two more can be installed in the same battery at a later date. The kilns will be driven by 75 h.p. two speed motors, provided with resistance for speed control. The clinker will discharge by gravity into three 9 by 73 foot rotary coolers, which in turn discharge directly to clinker storage. The kilns will be equipped for burning either coal or oil. Coal will be prepared in three special Raymond low-side five roller mills equipped with pneumatic feed controls and air separators. A short elevator will take the pulverized coal to a screw conveyor, which will deliver it to the kiln feed bins.

Traveling cranes will bring clinkers and gypsum from storage to the finish grinding department. Here four number 8726 Allis-Chalmers compeb mills, each equipped with an air separator, will grind the clinker to cement. The finished cement will be then taken to the 100,000 barrel silo storage by a Fuller-Kinyon pump system. Cement for trucks and rail shipment will be sacked at each end of the silos. A packhouse on the dock will prepare cement for shipment by water.

Steam for power and light will be supplied by means of waste heat boilers installed at the kilns. These will be three Edgemoor water tube boilers with 9170 square feet of heating surface, and will work at 225 pounds pressure. They will be equipped with Foster superheaters to give 150 degrees of superheat, and Foster economizer. Generating equipment will be one 4,000 k. w. and one 1250 k. w., 3 phase, 60 cycle, 2300 volt, 80 per cent power factor Allis-Chalmers steam turbine alternating units. The plant has been designed to be practically dustless. The plant was designed by the Cowham Engineering company, and will be operated as the Florida Portland Cement Company to produce cement under the Cowham System trademark.

Investigation of Low-Grade Bauxite

In the investigation of the beneficiation of low-grade Bauxite being undertaken by the Southern Experiment Station of the Bureau of Mines, Birmingham-Tuscaloosa, Alabama, the bauxites will be considered as being of two types, namely: high silica bauxites and high iron bauxites. Material of the first-named class has been obtained from Colbert County, Alabama, and of the last-named class from Cherokee County in the same state. In the case of most high silica bauxites, the main difficulty will be to separate the clay from bauxite minerals. In attempting to work out this problem float-and-sink tests will be made on various screen-sized products, to determine the degree of crushing which will be required to liberate the mineral from the gangue.

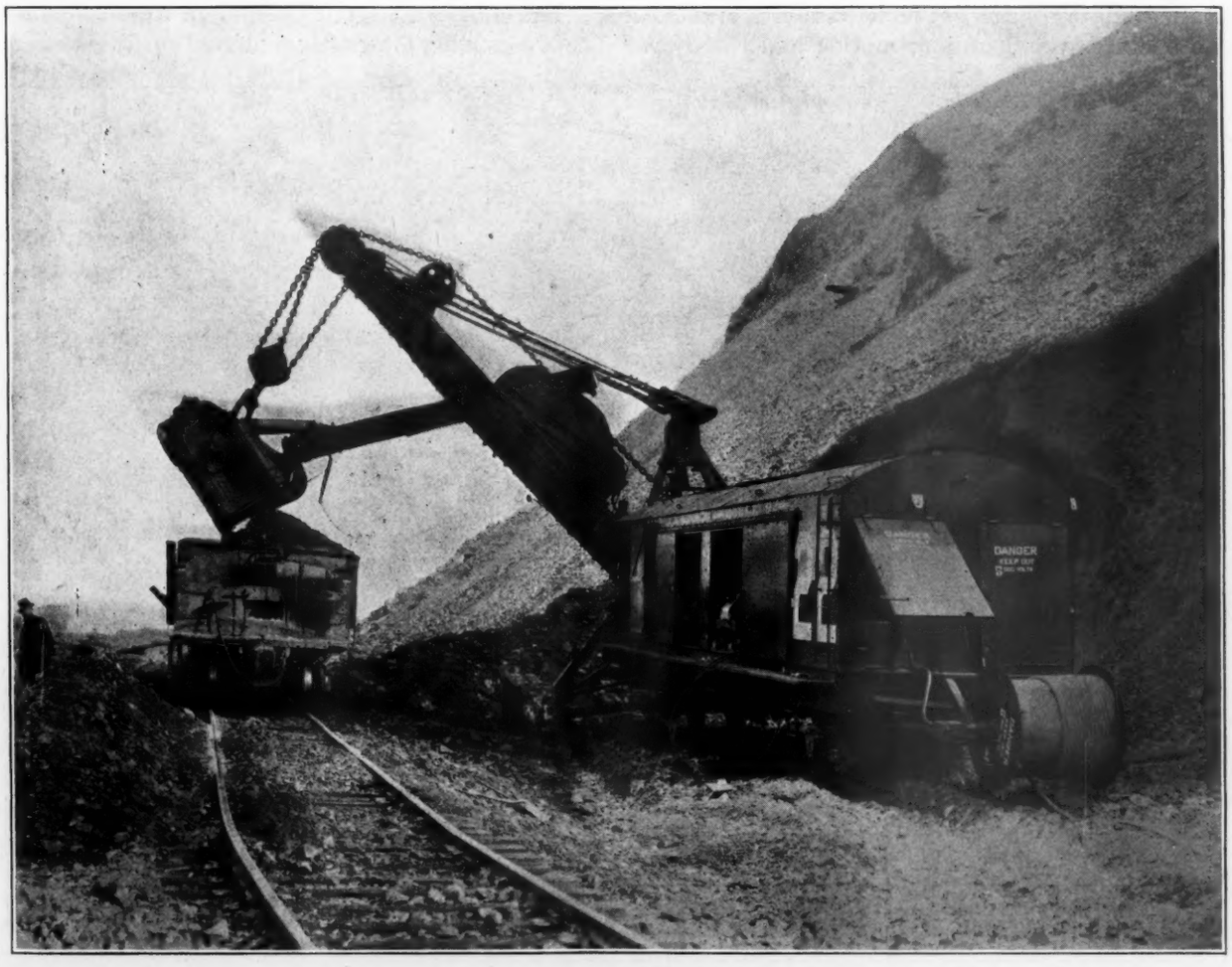
DEVELOPMENT OF ELECTRIC SHOVELS

By George Lee

THE first electric shovels were quite similar to the first steam shovels; they were of the friction type and employed a large number of gears, shafts, friction and bearings. Forward and reverse motions were provided for crowding, swinging and propelling; one single motion was required for hoisting. These seven motions were obtained from one continuously running motor. Later this single-motor type of drive was abandoned in favor of individual motor for each function. Both alternating current and direct current shovels were used on the first electrically operated units. However, experience has quite conclusively shown that the direct current shovel with Ward-Leonard control will handle more yardage at a less cost for power than when equipped with alternating-current motors.

The initial cost of an electric shovel is higher than that for a steam shovel; however, the maintenance and operating cost of electric shovels are so much less that the electric units are rapidly replacing the steam driven types. An electric shovel permits greater torque and pulls than steam drive and consequently is built stronger. Much of the equipment on electric shovels must be of a special nature especially on the larger types. Modern shovels provide three motions for the dipper or bucket; namely, hoist, crowd and swing. The hoist gives the upward and downward movements; the crowd gives the forward and backward motions; and the swing the sidewise or rotary motions. Power is provided for all these movements by means of gears, ropes, levers or separate drives.

Depending upon their types, shovels are classified as small revolving, railroad and large revolving units. Small Revolving shovels are built for service up to 50 or 60 tons working weight with ¾ to 1¾ yard dippers; railroad types, up to 110 tons with ¾ to 6 yard dippers; and large revolving shovels from 100 to 400 tons with 3 to 8 yard dippers. A small revolving shovel is one designed so that the whole upper frame including the cab is rotated. These shovels are fitted with crawling, caterpillar traction or car type wheels. The railroad type is arranged so that only a small swinging circle on the front end revolves with the boom and dipper. Both the



Large Electric Shovel Loading

caterpillar and standard railroad type trucks are used. The largest revolving shovels are provided with four railroad type trucks, one set being located at each corner of the machine. These trucks travel on special heavy rails.

Rail type, caterpillar, wide wheels, railroad wheels and rubber tired wheels are used on the various types and sizes of shovels. Practically all modern shovels have self propelling features, usually being operated from the hoist motors. The most popular type of traction is of the caterpillar variety. Small shovels are provided with a mechanical arrangement for steering. Large machines, using two sets of tractor belts, are provided with a smaller motor and push button control to turn the rear set of caterpillars for steering. The motive power for such equipments is applied to the forward set of caterpillars only. Shovels are further classified as electric, gasoline electric and Diesel electric. Unlike straight gasoline and straight Diesel types, which generally use friction drive, most electric shovels have individual motor drives.

Revolving electric shovels can nearly always be operated by one man; however, the railroad type shovels require two men because the dipper does not stay in the same postion, relative to the operator, during the swinging movements. This necessitates a shovel operator who is responsible for the hoisting and swinging movements and a craneman who operates the crowding motion and the dipper rope. The dipper trip mechanism permits the bucket to open and deposit its load. Its operation is accomplished by means of a motor-operated dipper trip rope. The motor is controlled by means of a push button located on one of the controllers. This button operates a contactor which short-circuits a section of resistance in the motor circuit. This arrangement is necessary to keep the slack out of the dipper rope. The large electric revolving type shovel is made a one-man machine by means of this motor-operated dipper-trip feature and a foot-operated controller for the rotating movement of the shovel.

Air operated, spring set mechanical brakes are used for stopping and retarding the various motions of practically all shovels. These brakes are governed by controllers by means of magnetically operated valves. The air pressure is provided by a small motor driven reciprocating air compressor set. A similarly operated and controlled clutch mechanism on the hoist motion is provided for permitting the dipper to be lowered freely. Large revolving shovels are provided with regenerative braking for controlling the dipper in its downward motion, thus conserving energy and reducing much wear and tear on brake bands. For mechanical reasons most friction braking is done on the jack shaft of the drive.

The choice of electric equipment for shovels rests between using alternating-current or direct-current

Large Revolving Railroad-Type Shovel With Four Trucks and Special Double-Flanged Wheels

driving motors. The first electric shovels were driven by alternating-current motors, but the trend is now markedly toward the use of direct current equipment. Alternating current drives when provided with transformer equipment takes up as much floor space as the direct current motors with the necessary motor-generator set equipment. Each type of drive, however, has its advantages, and the selection of equipment resolves itself into a question of considering the desirability and importance of these advantages. The first cost of alternating current apparatus is less than that for direct current; also, it involves fewer rotating parts. The control system is more familiar to most men. It has no standby losses and the power supply to the motor is of low voltage. In favor of the direct-current equipment the following points have been advanced; low power consumption, good power factor conditions and low power demand peaks. Most of the equipment is sturdy and reliable with high flexibility resulting in efficient operation, increased production and minimum abuse of mechanical parts. The application of power is smooth thus resulting in longer life, low maintenance costs and few interruptions to service.

Classification of Electric Drives

Friction Drive.—This type drive uses either one alternating-current or one direct-current motor.

Constant Voltage Drive.—Shovels with this kind of drive employ individual alternating current or individual current motor with rheostatic control. A direct current outfit of this type using series motors is illustrated in figure 1.

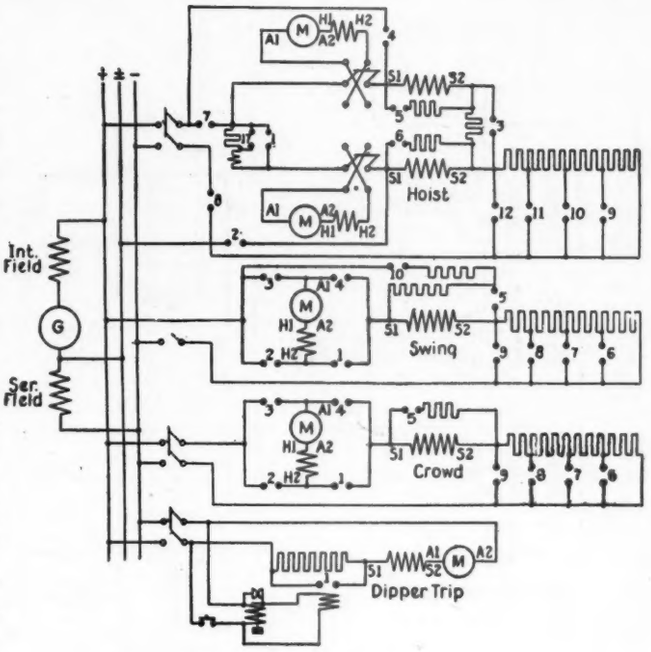
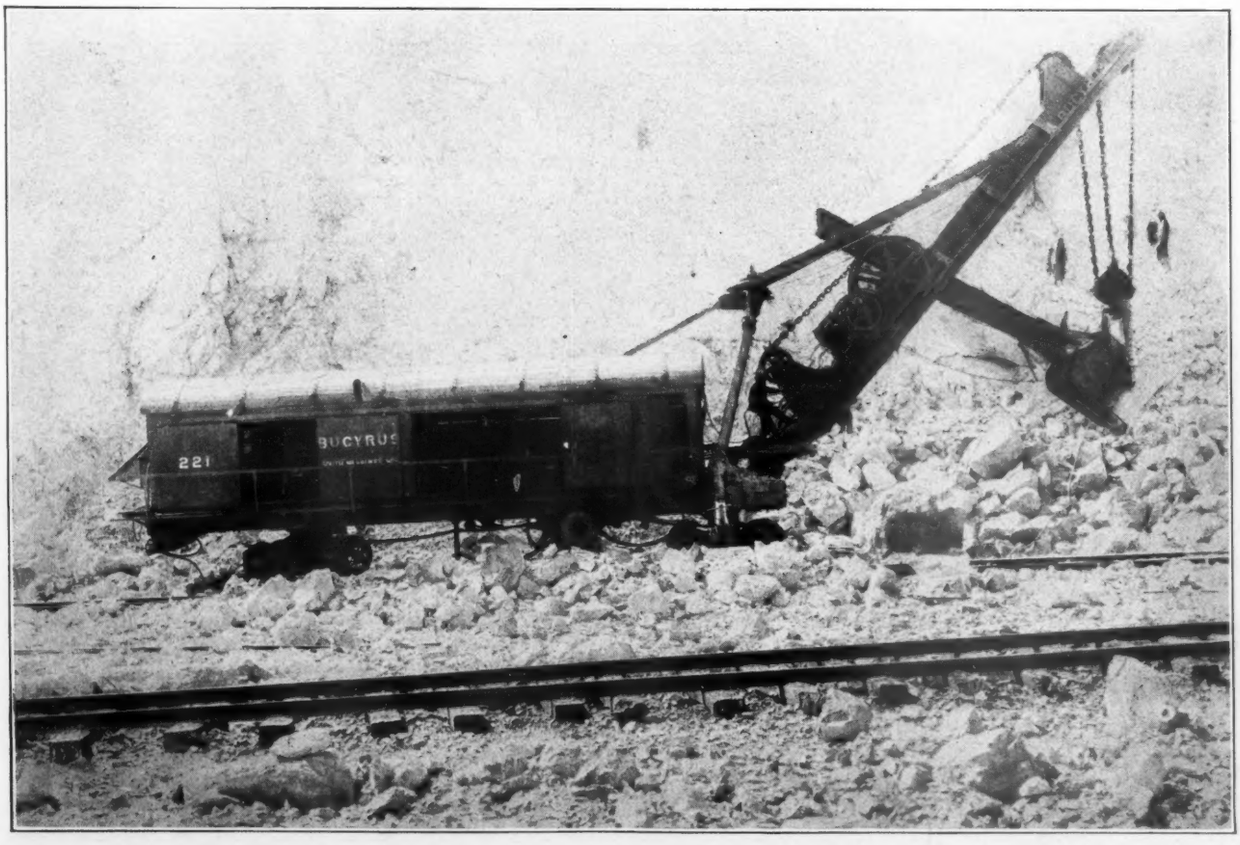


Fig. 1. Direct-Current Constant-Voltage Drive

Voltage Control Drive.—This system uses individual direct-current series or shunt motors for each motion; the motors are controlled by manipulation of the fields of their respective individual generators, as illustrated in figure 2.



Railroad Type Electric Shovel Loading Crushed Stone

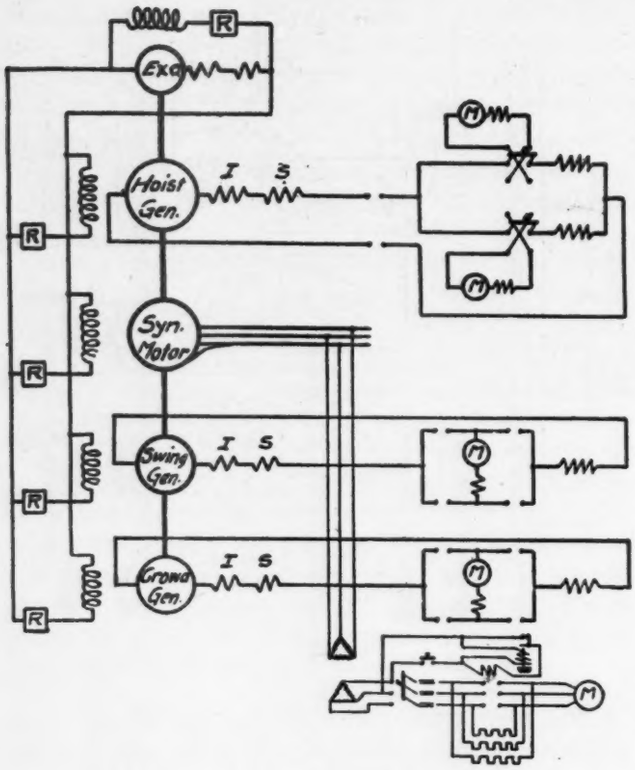


Fig. 2. Direct-Current Voltage-Control Drive

Friction Driven Shovel.—Motor running at constant speed and operating continuously are used with the friction-type drives. These machines are rarely rated more than 75 h. p.; therefore, a standard squirrel-cage motor with a compensator or a standard direct-current motor with a hand starter are used.

In most cases the power supply to the shovel is in the form of alternating current energy. A motor generator set is provided to obtain direct current where this kind of energy is used for the driving motor.

Single Generator Equipment.—To approach the advantages of full voltage control apparatus with single generator equipment it has been found advantageous to use a generator having a decidedly drooping volt ampere characteristic with no load voltage higher than normal, and voltage at maximum load as low as is consistently possible. This feature amplifies the desirable characteristic of the series direct-current motors and produces a faster operating shovel with lower peak power demands and strain. These advantages have proved to be so valuable that even where direct current is supplied to a direct current drive shovel, a direct current to a direct motor current motor generator set is frequently interposed between the supply line and the drive motors.

Constant Voltage Control.—Both alternating current and direct current motors have been used with constant voltage systems for driving electric shovels. When induction motors are used, rheostatic control is provided in much the same manner as for individual alternating current, slip ring induction motor hoists. A separate motor is used for each motion of the shovel. Series type direct

Electric Shovel at Verplank Quarry of the New York Trap Rock Corporation

current motors have been used and speed regulation obtained by means of rheostatic control, as shown in figure 1.

Induction Motor Shovel.—An alterating current shovel driven by induction motors ordinarily consists of the following parts:

1. A flexible cable for conducting alterating-current energy to the shovel, usually about 600 k v a at 2,300 volts.
2. An incoming line switchboard panel providing overload protection.
3. A bank of transformers for suppling low-voltage power for the motors.
4. Control equipment consisting of the following:
   a. Automatic panel including line switch, reversing line contactors, overload and accelerating relays, ammeter and accelerating and speed regulating contactors.
   b. Secondary accelerating and speed regulating resistors of the cast iron grid type.
   c. Reversing master switch.
5. Driving motors of the slip ring induction type, designed to give high maximum torque and embodying rugged mechanical construction.

Voltage Control System.—When the voltage-control or Ward-Leonard system for individual direct-current shovels was first used, series motors were employed. Later, however, separately excited direct-current motors have become more popular. Figure 2 illustrates this control equipment which includes a five-unit synchronous motor-generator set. The adoption of separately excited motors made the control equipment less complicated. The

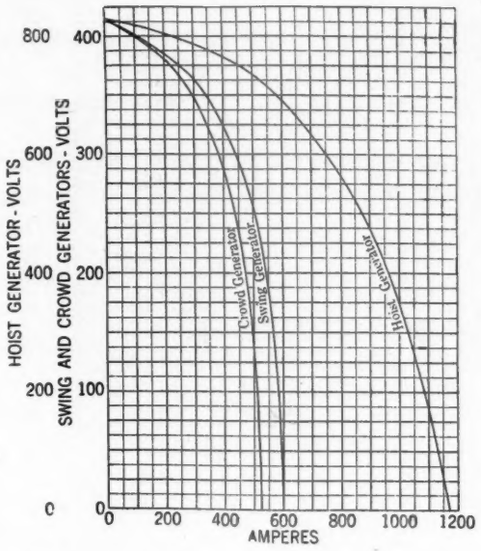


Fig. 3. Shovel Generator Characteristic Curves

hoist motor, swing motor and crowd motor have their own generator with individual shunt field control. All three generators are driven from one synchronous motor. The excitation for all machines is supplied from a compound-wound direct-connected exciter unit.

The generators on the direct current voltage control types of shovels possess the special characteristics shown in figure 3. These are obtained by the use of separately excited, self excited and differential field windings, in proper proportions, all on the main field poles. The characteristics thus secured provide positive protection against overloads without the necessity for relays or other auxiliary devices.

Electric Shovel Loading Iron Ore

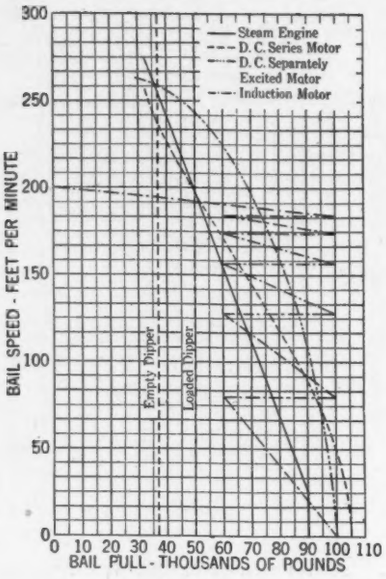


Fig. 4. Curves Showing Characteristics of Shovels Equipped With Various Kinds of Motors

The series type or separately excited direct current motors, when supplied with energy from generators with suitable characteristics, have inherent variable speed torque operating advantages. These motors will then give flexible operation most conducive to efficient power consumption. Indeed, the desirable features of stalling under loads and running at high speeds under light loads, common to steam shovels, are closely duplicated. The curves in figure 4 illustrate this point. The voltage-control system makes it possible to obtain creeping speeds even with light loads. Furthermore, the use of a motor-generator set interposed between the line and the driving motors provides a "cushion" which prevents undue strains being placed upon the equipment or high power demands upon the supply system. The induction motor type drives do not possess this advantage.

The power consumption of direct-current shovel using energy supplied through a motor-generator set is relatively lower than for an alternating current driven shovel if the shovel is kept busy. The rheostatic losses with alternating current shovel, especially when digging is hard, are always high. Also, the induction motor drives produce higher peak power demands than direct-current equipments when developing the same torques. Induction motor type shovels are also more susceptible to variations in the main voltage . A small drop in the voltage supply of an induction motor always results in a correspondingly large drop in torque. A synchronous motor, (the type used with motor generator outfits) always runs at constant speed. The lower WR_2 possible with direct current motors is another advantage in their favor. Generally an induction motor has an inherently high WR_2 value when designed for shovel service.

Parts of Direct Current Separately Excited Motor Driven Shovels.—The essential parts of a direct-current voltage-control type of shovel using separately excited motors are:

1. A flexible cable carrying alternating-current energy, usually about 400 kva. at 2,300 volts.

2. An alternating-current incoming line switchboard including a starting panel for controlling a synchronous motor on the power-converting motor-generator set.

3. A motor-generator set comprising a synchronous motor connected to three generators; one for the hoist motor, one for the swing motor and the other for the crowd motor. A directly connected exciter of suitable capacity for supplying excitation for the direct-current motor and generators and the synchronous motors of the set.

4. Control equipment consisting of field resister for motors and generators with suitable drum controller for varying the field strength and reversing the connections.

5. Driving motors with separately excited fields. These have their armature circuits solidly connected to their respective generators.

All equipment used on a shovel should be such that the bearings, panels, switches, contactors, controllers, etc. can withstand vibration and also provide proper lubrication without loss, breakage or spillage. This must be true particularly with machine bearings. Provisions should also be made to take up lost motion so the equipment may operate satisfactorily on steep grades.

Uses of Graphite

Natural graphite is used chiefly in the manufacture of foundry facings, pigments and paints, crucibles, pencils and crayons, and commutator brushes, states the Bureau of Mines, Department of Commerce, in a recently issued report. As the result of an investigation by the United States Tariff Commission, it was found that, contrary to general opinion, the use of graphite in the manufacture of crucibles is comparatively small. Only 15 per cent of the consumption for finished products went to this use in 1923 and 13 per cent in 1924. Foundry facings consumed the largest proportion—44 per cent in 1923 and 52 per cent in 1924. Pigments and paints were second in the quantity of graphite consumed—16 per cent in 1923 and 18 per cent in 1924. The manufacturers of pencils and crayons and of commutator brushes ranked fourth and fifth as consumers of graphite, each taking 9 per cent in 1923 and 5 per cent in 1924. These five products used 91 per cent of the total in 1923 and 93 per cent of it in 1924. Only three uses, all minor, showed increases in 1924 as compared with 1923. Graphite for bearings and bushings and for lubricants commands the highest prices.

DEVELOPMENTS IN FUSED ALUMINOUS CEMENTS

By C. P. Harris, Technical Director, Universal Trade Press Syndicate

CIMENT-FONDU was first produced in France by Biehl in 1908. For some time this product excited only academic interest and little development occurred until after the war. The investigations of its composition, changes occurring in setting and of its application are of comparatively recent date. Portland cement was improved by sintering it almost up to 1600 degrees centigrade and grinding it to an exceedingly fine grain. This product was put on the market by German manufacturers in 1920 and exhibited a decided improvement in strength and in rapidity of curing. This material was called "High Quality Portland" cement and was offered, apparently to compete with the French fused cement. In 1924, however, Germany also found it necessary to produce "Tonerdeschelzzement" or Fused Aluminous Cement.

Fused aluminous cements are characterized by (1) rapid curing but slow setting, (2) evolution of much heat during setting so they may be utilized in cold weather work and (3) great resistance to disintegrating influences of salt solutions. Such valuable properties have naturally attracted much attention and many investigations have been carried out and are still under way to determine in what respects these new cements differ from Portland cement and what are the most economical methods of production.

Aluminous cement consists mainly of lime, silicic

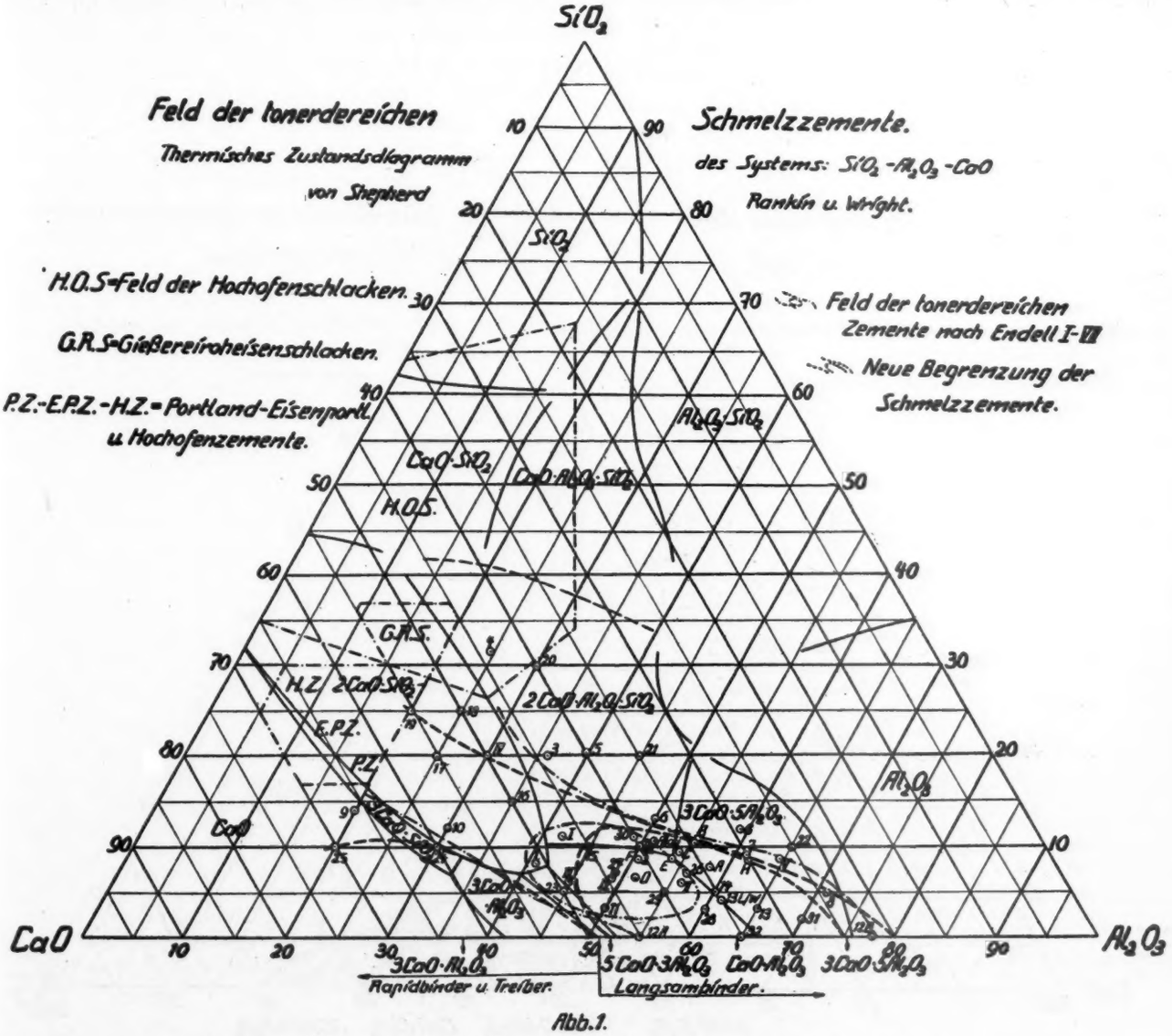


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Figure 1. Region of Fused Aluminous Cements. Thermic diagrams of the Systems $SiO_2Al_2O_3$-CaO.
H. O. S. = Region of Blast Furnace Slag Cement.
G. R. S. = Iron Foundry Slag Cement.
P. Z.—E. P. Z.—H. Z. = Portland, Iron and Blast Furnace Cements.

—.—.—.—.—. = { Field of Aluminous Cement After Endell
..... = { Limits of Fused Cements After Berl and Loblein

acid and alumina, just as Portland cement, but in the case of the former the amount of alumina is much increased at the expense of the other two ingredients. At first it was attempted to make aluminous cement by sintering, using the same process as that for Portland. But it was soon found that aluminous cement could be produced satisfactorily only through complete fusion. Beside lime and bauxite, clay marl, kaolin, slags and coal ash are advocated as raw materials. Whatever raw materials are used the fused product is limited to the region alumina, 45-70 per cent, lime 47-28 per cent, silicic acid 12-0 per cent.

Fusion Methods

Improvements in the method of fusion are rapidly being devised. One method consists of a fusion in a rectangular water-jacketed kiln; after removal of carbon dioxide from the lime used. Another method makes use of a rotating cylindrical furnace, where it is sintered, but on passing through the outlet, the sintered mass makes an electrical contact between the side of the furnace and an electrode and is fused in the resulting current flow. Still another method involves the use of the electric furnace, either open or closed, using carbon electrodes. Electrical fusion methods do not require previous removal of carbon dioxide. Another fusion method involves apparatus similar to that used for the production of coal gas making possible a continuous process with the raw materials so added that the resulting slag contains the desired proportions of lime, alumina and silica. All of these kilns are lined with pressed carbon. The atmosphere is always a reducing one, and the iron oxide is reduced to iron. If an excess of silica be present the latter is also reduced to silicon with the resulting formation of ferrosilicons. But it is preferable to use bauxite as free as possible from silica. Instead of cooling the melt in iron vessels by air and sometimes by water, it recently has been

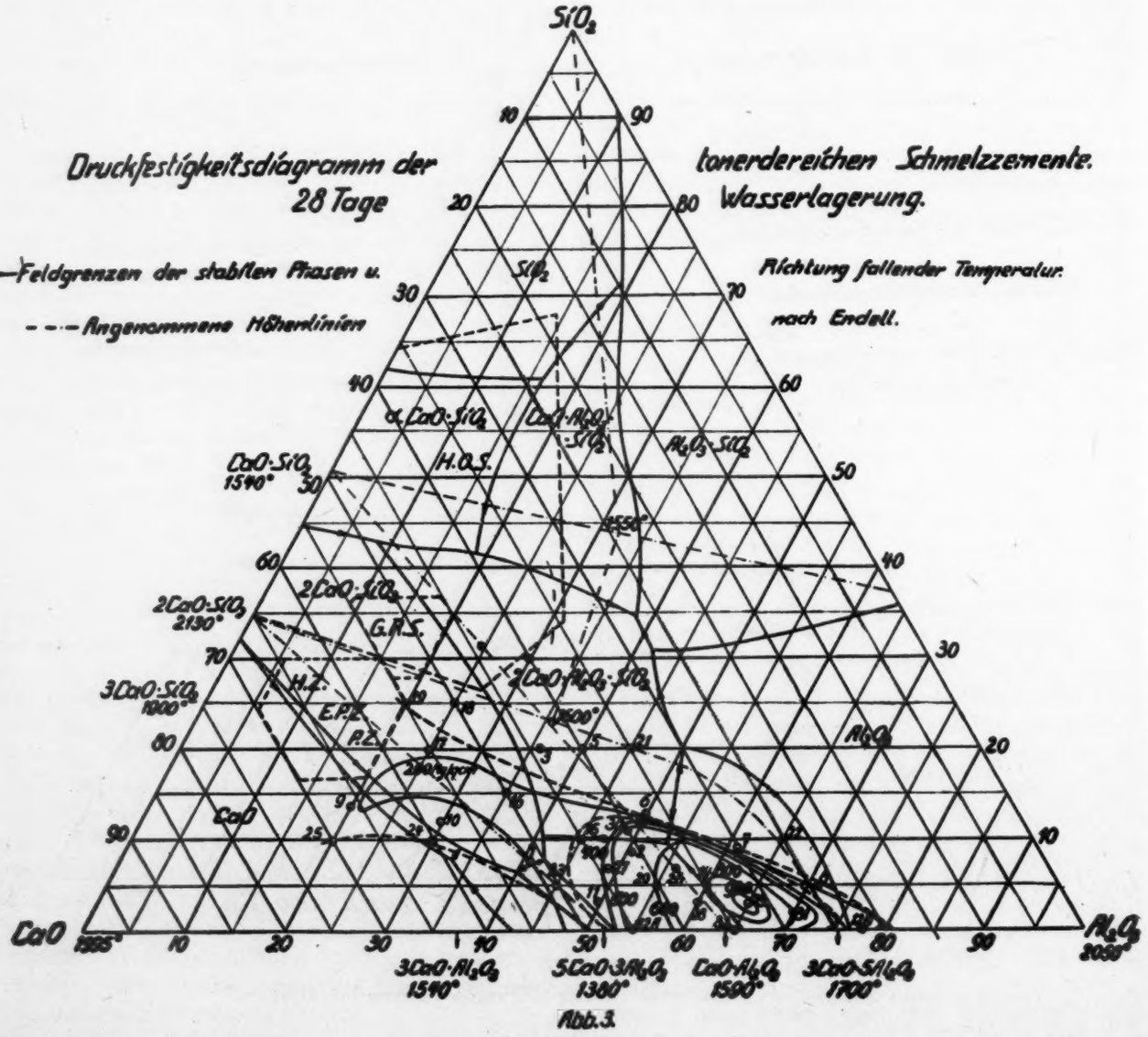


Figure 2. Crushing Strength Diagram of Fused Aluminous Cement 28 days water cure. Figures on diagram are kilograms per sq. in.

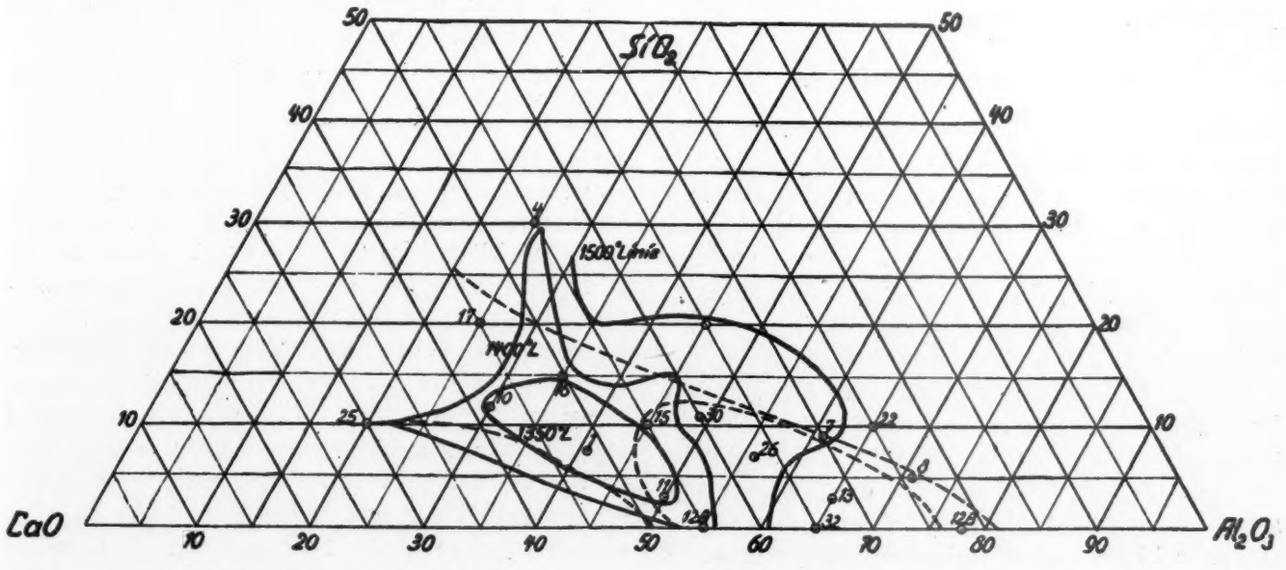
found preferable to cool the product slowly, as this results in a product with longer setting period and higher crushing strength. One patent mentions the use of fluorspar as a flux. If this is used the fluorine of this calcium fluoride is evolved in the form of silicon fluoride, which should be a valuable by-product. The fuel consumption of the water-jacketed kiln is said by Biehl to amount to 25-30 per cent of the fused cement. In the electric furnace 0.7 kilowatt of current is consumed for each pound of cement. The latest proposal in fusing methods is to combine the electric and revolving kilns.

Characteristics of Aluminous Cements

The hydraulic modulus of Fused Aluminous Cement is 0.5-1.0 as against 1.7-2.2 found in the best Portland cement. The silicate modulus is 0.1-0.3 in contrast with 1.2-4.0 of Portland cement. A thin section of aluminous cement shows large crystals. These are penta calcium aluminate and tricalcium aluminate. The latter is the chief constituent of the hardened cement according to Dykerhoff and also according to Berl and Löblein. The latter, however, believe that the tricalcium salt is first formed in hydrated condition. They describe the setting of fused aluminous cements as follows: Addition of water causes aluminum hydrate and small amounts of calcium hydrate to disslove. After a few days a gel begins to separate consisting mainly of aluminum hydrate. Further hydrolysis causes supersaturation of the solution. The result is that colloidal $Al(OH)_3$ and some $Si(OH)_4$ separate and the cake sets to a solid mass. After this procedure, a different reaction apparently takes place with watery gels of $Al(OH)_3$, $Si(OH)_4$ and $Ca(OH)_2$ forming tricalcium hydro-aluminate, which crystallises out in the alumina gel to form a solid felt of crystals and cause a good hardening to take place.

Before the cement is wet with water, the main substance present, according to the same investigators, is the monocalsium aluminate. In figure 1 is shown the composition of various cements. These include Blast furnace slag cement, Iron foundry slag cement, Portland, Iron Portland, Blast furnace cement, and two regions showing the field of aluminous cement as plotted by Endell and that plotted by Berl and Löblein. The small oval outlines the region of the best quality fused aluminous cement, while the long strip starting at the Portland cement region and extending almost to the Al_2O_3 corner shows the whole region of fused cements. The fact that this field adjoins that of the Portland cement, demonstrates that no sharp line can be drawn between these two materials, as a low quality fused product may be indistinguishable from a high quality Portland. The formation of the tricalcium hydroaluminate in the setting is a strongly exothermic reaction, one that liberates much heat, making the cement during setting much warmer than its surroundings. This property accounts for the excellent results obtained with these fused cements in very cold weather.

Although the setting time is not very different from that of Portland, it is quite definitely a function of the chemical composition. It is also influenced by the fusion temperature, the period of fusion, the rate of cooling of the melt and the fineness of pulverization. In general, the longer the melt is kept fused and the slower it is cooled, the longer will be the setting period according to most recent results.



Schmelzpunktslinien der tonerdereichen Schmelzzemente.

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Figure 3. Melting Point Curves of Fused Aluminous Cements.

It is well known, however, that the hardening is much more rapid than that of any other similar cement. Aluminous cement shows the same change in two hours that Portland cement shows in ten days, according to Dykerhoff. The calcium hydroaluminate appears to be dehydrated three hours after it is formed with the production of tricalcium aluminate and water. At the same time a turbidity appears due to colloidal hydroxides. These form crystals after three to four weeks and result in the final hardening. A standard measured test of fused aluminous cement mixed in the proportion of 1:3 with standard sand, according to the recent work of Biehl, shows that the following strength figures are found:

Time of Setting	Crushing Strength	Tensile Strength
5 hours	3,760 lbs. / sq. in.	305 lbs. / sq. in.
10 hours	6,850 lbs. / sq. in.	340 lbs. / sq. in.
15 hours	7,400 lbs. / sq. in.	345 lbs. / sq. in.
24 hours	8,300 lbs. / sq. in.	355 lbs. / sq. in.

These figures show how quickly the initial hardening takes place. In figure 2 Berl and Löblein show the crushing strength of fused aluminous cement after 28 days water cure. The figures are in units of kilograms per sq. centimeter and can be converted to pounds per square inch by multiplying by 14.5. The highest value of 900 kg/sq.cm. or 13,000 lbs. per sq. in. was attained in 28 days by one of these cements.

German investigators claim that while the French product is stronger at the outset, after 28 days the former material is superior. However, one of the chief advantages of aluminous cement is its rapid hardening, and in this respect the French material is better. This is to be expected, as the new cement has been made in France for several years more than in Germany.

Effect of Chemical Solutions

According to Biehl, aluminous cement is unaffected by sea water. While it is not resistant to acid, it withstands acid longer than other mortars. In a mixture of 1:3 its crushing strength showed a tendency to increase in water, a 5 per cent magnesium chloride, a 5 per cent magnesium sulphate and a saturated calcium sulphate solution. Sulphuric acid he found to be injurious, however, and a 3 per cent sulphuric acid solution caused it to lose its strength. Similar results are obtained in a proportion of cement to sand of 1:5. According to Berl and Löblein, fused cement cured in saturated gypsum merely retarded the setting. It was also stable to 10 per cent solutions of sodium chloride, magnesium chloride and calcium chloride. Sodium bicarbonate solution, however, vigorously attacks it and lessens its strength. The strength of its resistance against strong solutions of sodium chloride, magnesium sulphate, and potassium bisulphate increases with rising alumina content and is generally very high. In comparison with Portland cement it is more resistant to chemicals more commonly encountered, but not to all. Portland is more resistant to the action of sodium bicarbonate and to mineral oils.

Application

The working of fused cement involves the same principles as the other cements, but somewhat greater care must be taken. Clean sand and the proper amount of water must be used. The outside covering should be well wetted. The "sanding off" scale often found on the surface is due to the action of the carbon dioxide of the air according to H. W. Gonell and can be decidedly reduced by covering the surface with a wet cloth during the setting period. Mixing the fused cement with other cements containing lime should be avoided.

Due to the evolution of heat during setting, which eliminates danger of freezing and deterioration, it is particularly desirable for use in cold weather for any sort of concrete work. Its quick hardening makes it of great advantage in street paving, where the time of traffic interruption can be very much reduced. Its great resistance to salt solutions makes it an ideal submarine mortar, and for all varieties of marine structures. It is desirable for spans of bridges because its elasticity is greater than that of the other cements.

Consumption of Asphalt Products

In the manufactured asphalt industry in the United States in 1925, the output of solid products was, as usual, of much more importance than that of the semi-solid or liquid products, such as flux and road oil, states the Bureau of Mines, Department of Commerce, in a recently issued report. The sales of paving asphalt, which comprises the major part of the solid class, amounted to 1,326,250 tons, valued at $19,218,690. This represents an increase over 1924 of 96,911 tons, or 8 per cent, and of $3,296,360, or 21 per cent. The sales of the class next in importance—roofing and waterproofing asphalt—were 854,100 tons in 1925, the value of which was $11,692,780. This represents only a slight increase in quantity over 1924, but a 15 per cent increase in value. The sales at refineries of mineral rubber in 1925 were 20,020 tons, a gain over 1924 of 53 per cent. The sales of flux and other liquid products in 1925 were lower than in 1924, due to a decline in paving flux. Road oil to the amount of 351,510 tons was sold at the refineries in the United States during 1925. This represents a gain of 24,191 tons, or 7 per cent, over 1924.

DEVELOPMENTS IN HYDRAULIC HANDLING OF SAND AND GRAVEL

By G. B. Massey

The speed regulation of the winch is obtained by draulic dredging in 1926 is the construction of a thirty inch hydraulic dredge by the Bucyrus Company for the Great Lakes Dredge & Dock Company. This dredge has a steel hull 245 feet long, 50 feet beam and 14 feet depth of hold and will have a draft of 9 feet 6 inches when in operation.

The pump is direct connected to a 3,000 horse power variable speed motor and the cutterhead is driven by a 700 horse power variable speed motor. The speed rgulation of the winch is obtained by Ward-Leonard control, a motor driving a generator which in turn drives the winch motor. All power is supplied by four 1150 Horse Power Busch Sulzer Diesel engines direct connected to generators supplying direct current at 600 volts. The ladder is 75 feet long and the dredge can dig to a depth of 50 feet.

The most novel feature is the two stern spuds which are 48 inches in section and 82 feet long and are arranged to pin up, the object being to give the spud point more of a hold with a portion of the weight of the hull bearing on it, than would be the case if only the weight of the spud were available. This dredge represents the very last word in hydraulic dredge construction and is a forceful example of the place the hydraulic dredge has acquired in excavation.

Another reason for the increased popularity of the hydraulic dredge is that operators are beginning to realize that a hydraulic dredge without a cutterhead is apt to be a very expensive toy, whereas a dredge equipped with a proper cutterhead can be handled so as to produce a fixed yardage for the pump instead of pumping clear water for several minutes and then plugging the line.

A hydraulic dredge pump and pipe are capable of handling a certain yardage and it is the duty of the cutterhead to see that the material is introduced into the suction mouth at the maximum rate which will avoid plugging the pipe. No substitute for the cutterhead will do this. The cutterhead is an excavator and also a regulator.

Most sand and gravel installations comprise the following operations:

1. Excavation.
2. Translation horizontally from a constantly changing point of origin to a fixed point of discharge for treatment.
3. Raising from above ground level to a sufficient height to wash and screen while the material descends to the elevation required for bins or cars.
4. Washing to remove silt, clay, etc.
5. Drying.

If the excavation is accomplished with the aid of a dragline or shovel, with its crew, there is usually required one or more locomotives each with its engineer. One or more switchmen are usually in evidence also. And labor is required to dump the

A Model Dredging Outfit

cars, so that the excavation and translation horizontally are expensive where labor rates are high.

The lifting is usually accomplished by an inclined belt conveyor which is the cheapest possible method of conveying either horizontally or up a reasonable grade any material which is suited to this manner of handling. The belt conveyor is self-loading and dumping so that no labor is required for it. The screening and washing requires only supervision. If a hydraulic dredge is used, the entire labor required for excavating, translating laterally and raising to the necessary heights, consists of the dredge operator and a helper who are assisted now and then by other men when it is necessary to put down a dead man for a new anchor location. In the hydraulic dredge we have substituted for a high labor cost, a greater power requirement and a heavier renewal charge. The greater power requirement is due to the fact that, for every unit volume of sand and gravel pumped, nine units of water have to be pumped.

The resistance which has to be overcome by the dredging pump is known as the head against which the pump delivers. It is expressed in feet of water. This resistance includes the suction created at the mouth of the suction pipe where the opening is lessened by the material crowding into the pipe after it is dislodged by the cutterhead. It also includes the inertia of the water which has to be started from rest and a velocity of 10 to 15 feet per second maintained. The vertical lift from the water surface to the point of discharge is called the static head and it usually represents a considerable part of the total head. The friction of the water solids in the pipe line is subject to variation by a choice in the size of pipe used and the velocity maintained in the pipe. In some hydraulic plants, the horizontal translation is by pipe and the vertical belt conveyor.

It is not quite correct to say that the static head is the elevation of the discharge above the water level of the pond from which the water and solids are being pumped. This is only true if the pipe is running full of water all the way through the pipe and discharging a pipe-ful at the exit. If the pipe goes up over a considerable rise and the descent on the far side is steep enough, the pipe may rise above the hydraulic gradient and flow only partly full of water for a considerable distance before reaching the discharge end.

If these conditions obtain, it is necessary to use, for the static head, the vertical distance between the water surface in the pond and the point in the pipe where it ceases to run full. If it is not certain what the location of this point is, it is safest to figure, for static head, the center of the pipe where

A Cutter Dredge Built for the Duluth Superior Dredge Company

it passes over the high point.

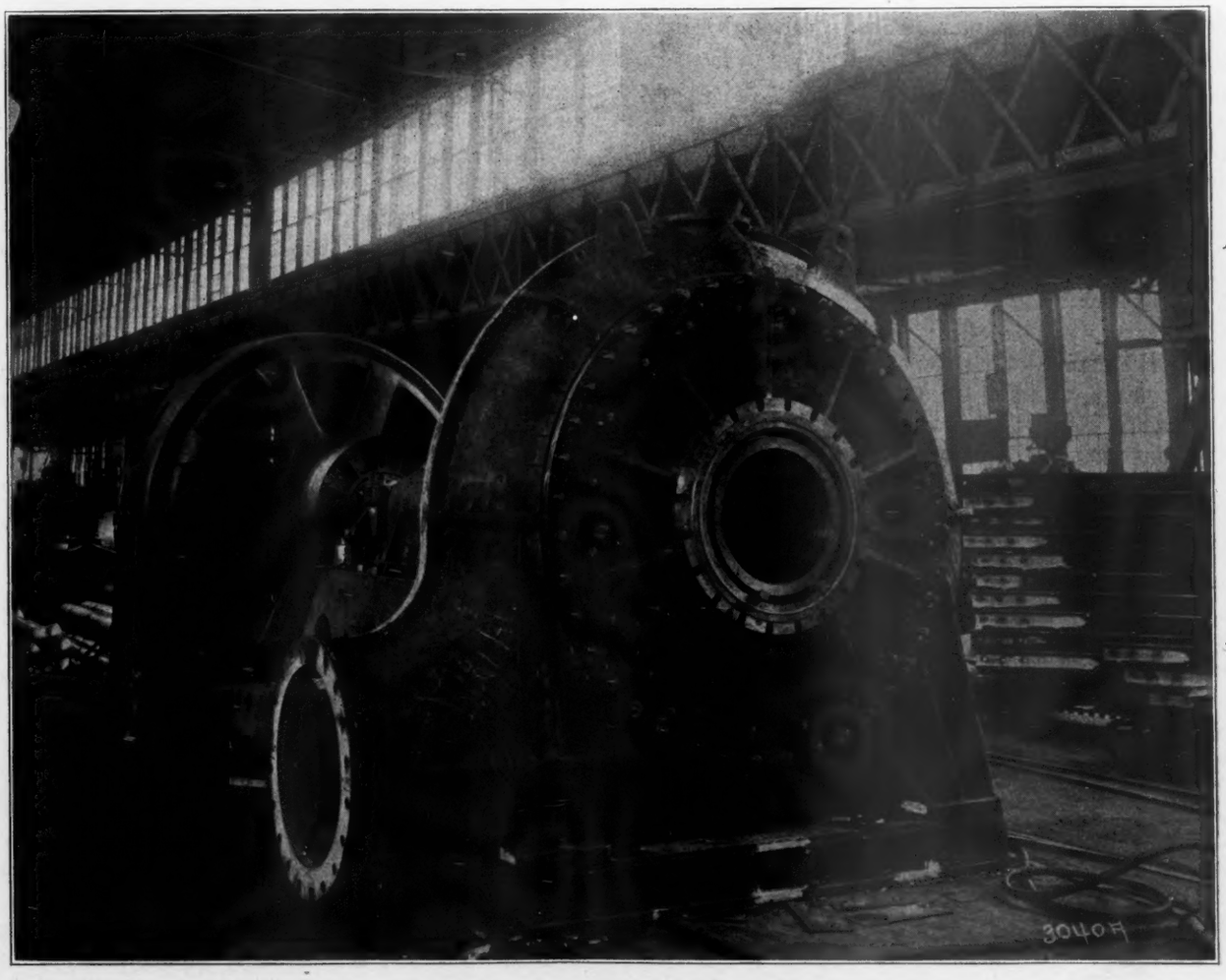
In these days of dependable electric power and economical heavy oil engines, the hydraulic dredge is coming into its own. It not only excavates, but it translates and lifts and washes. Very little improvement can be made on the modern cutterhead and the power required to drive it.

The centrifugal pump as designed and built for dredging, has not a high efficiency and probably never will, as this feature is sacrificed to the necessary clearances, desirable speeds, etc. The friction loss in horizontal pipe lines is always a most important consideration especially in the case of a mixture of water and solids. The vertical lift can be lessened by a method suggested by the discharge line going over some high point in its length. This method has just been granted a United States patent. It is based on the fact that a large weight of water has to be lifted in order to lift a comparatively small weight of solids. And yet the solids are retained momentarily at the highest elevation before starting through the process of treatment, while the water finds its way back to the same pond from which it came.

If, however, the water could be pumped up to a high point and there discharge the solids in a closed bin and the water return to the pond by a closed pipe dipping into the pond, the water in the down pipe would balance the water in the up pipe and the horse power required would be lessened by the use of the syphon principle. Also the sand and gravel would be collected at the high point by depositing from the comparatively slow moving stream of water through the top of the bin. The velocity across the bin would deposit sand and gravel but not silt and clay water which would be returned through the down pipe to the pond. Thus a very effective washing would be effected.

Of course the bin has to be air tight, or reasonably so, to function correctly. This is accomplished by a form of gate which permits the sand and gravel to be removed from the bin without breaking the water seal. It can be seen that the invention is a basic one in the hydraulic handling of sand and gravel where a considerable lift is required as it reduces the large power requirements which have always been considered in comparing the hydraulic method against other methods.

In 1923 California alone had over 2,000,000 square yards of "Black Base" pavement over ten years old. The City of Denver has been building "Black Base" at the rate of about a half million square yards per year during the past few seasons.



A Dredge Pumping Unit of Latest Design

DEVELOPMENTS IN THE GYPSUM INDUSTRY

By H. J. Schwein, Chief Engineer The Gypsum Industries

MOST important of the developments in the gypsum industry in 1926 has to do with the structural use of gypsum. Based on the research investigations now under way, the results of tests already conducted, and the tonnage increase during the last few years, the structural use of gypsum is destined to be the most important development in the industry for several years to come. The inherent advantages of gypsum fire resistiveness, light weight, insulation—are in no other product so important as in gypsum floors and roofs. The fire resistive value of gypsum has been demonstrated not only in laboratory tests, but in actual fires and conflagrations. Fire, load, and water tests, on poured gypsum floors were conducted as early as 1897 and numerous fire tests have been conducted on various types of gypsum floor and roof constructions since.

The light weight of gypsum floors is a very important factor in the increased demand for this type of construction. Take for example the poured-in-place suspension system, which is the oldest system of gypsum floor construction on the market. It weighs four pounds per inch of thickness, hence a four-inch slab would weigh sixteen pounds per square foot. The decrease in dead load made possible by the difference in weight between a poured gypsum slab and any other type of fireproof floor construction, will effect a considerable saving in the supporting beams, girders, columns, and footings.

While there are numerous types of both poured and pre-cast gypsum floor construction on the market, they can all be divided into two groups as follows: one where the reinforcing is designed to carry the entire live and dead load as in the suspension system, and the other where the gypsum and the reinforcing jointly resist the stresses set up in the construction.

Suspension systems are of two kinds, namely, those that are poured-in-place on the job and those that are pre-cast at the mill and are shipped to the job as individual units. In the pre-cast suspension system, the suspension principle is adhered to by tying together the ends of the reinforcing wires which project from the ends of the tile.

In the suspension systems the stress in the wires or cables is determined by the formula:

$$T = \frac{wL}{8d} \sqrt{\sqrt{L_2 + 16d_2}}$$

In the formula "T" is the maximum tension in the cables per foot width of span, "w" the load per square foot, "L" the clear span between supports in feet, and "d" the deflection or dip of the wires or cables at the center of the span in feet.

In those systems where the gypsum acts structurally the construction is designed in accordance with the recommendations of the Joint committee on Concrete and Reinforced Concrete using appropriate unit stresses for gypsum. These systems are also poured-in-place or precast depending on the span and load, as well as on the type of occupancy and pitch of roof.

A recent type of gypsum floor construction developed is one especially designed to be used in connection with steel or metal lumber joists. Over the metal joists is placed either a ribbed metal lath or gypsum wall board on top of which is poured approximately two inches of either gypsum fiber concrete or gypsum stone concrete. When wall board is used as a form, the gypsum is reinforced with an electrically welded, galvanized, metal fabric. Here again the light weight of gypsum lends itself admirably to this newer type of floor construction.

In May, 1926, a fire, load, and water test was conducted at Columbia University, New York City, on the type of gypsum floor construction noted above. Structural steel channels were erected spaced 30 inches on centers, on top of which was laid ½" gypsum wall board; then a 2½" thickness of gypsum fiber concrete was poured in place. A reinforced gypsum ceiling 2-¼" thick, also poured in place, was attached directly to the underside of the channels and the ceiling surface plastered with three coats of gypsum plaster.

This construction was tested in accordance with the requirements of the New York City Building Code which requires that before any new type of floor or roof construction can be used in the city of New York it must pass the following test:

At least one panel of the proposed maximum span carrying a live load of at least 150 lb. per sq. ft. shall be subjected to a fire continuous for 4 hours at an average temperature of 1700° F., followed by the application, for not less than 10 minutes, of a hose stream from a 1⅛ inch nozzle at 60 lb. nozzle pressure without appreciable deterioration or the passage of flame through the floor during the test. In addition, the floor must sustain, after the test, a uniformly distributed live-load of 600 lb. per sq. ft., without exceeding a stated permanent deflection.

The above requirements are considerably more severe than either the Fire Test Specification of the American Engineering Standards Commitee or the American Society for Testing Materials Standard Specifications for Fire Tests of Materials and Construction.

The temperature of the fire reached a maximum of 1891° F. The temperature of the lower flange of the channels measured at two points reached

202° and 205° F. respectively after a four hour fire duration. The upper surface of the floor averaged 124° F. with a maximum of 132° F. at one point.

In this test, as in every other fire and water test on gypsum construction, when the water was applied it washed off that part of the construction which was calcined by exposure to the fire. The application of the hose stream under 60 lb. pressure to the underside of the ceiling slab, after it had been subjected to a four hour fire test, washed away the calcined ceiling slab, but the floor slab and the structural frame work were unaffected by the fire and water. When the test load of 600 lb. per sq. ft. was applied, the deflection increased from 0.38 inches, as a result of the four hour fire and ten minutes water application, to 1.04 inches, increasing to 1.21 inches after twenty hours. When the test load was removed the permanent deflection was found to be 0.38 inches. The behavior of the construction in the test described above clearly demonstrated the value of gypsum as a fireproof floor and roof construction.

Fourth Potash Exploration Site Designated by Bureau of Mines

The Bureau of Mines, Department of Commerce, announced recently that Judkin Station in the southwestern part of Ector County, Texas, has been chosen as the location of the area designated as fourth in order of availability for potash exploration purposes in the investigation being conducted by the Federal Government looking toward the development of ample domestic supplies of potash centers. This is one of the four prospective sites recommended by the United States Geological Survey for the sinking of test holes in pursuance of the program authorized by the Act of Congress approved June 25, 1926, which makes available the sum of $100,000 per annum for a period of five years, to be expended under the direction of the Secretaries of the Interior and Commerce in the endeavor to find commercial potash deposits in the United States. Announcement has previously been made of the location of two available sites in Upton County and one site in Crockett County, all lying within the same general area as the fourth site now made public.

In the Ector County location just announced, two strong showings of potash-bearing salts appear in cuttings obtained from the Connell 1 B oil well at points 1,300 and 1,600 feet below the surface. The depth to the top of the salt is 1,000 feet. The probable maximum depth required for the drilling of a test hole is 2,000 feet. The proposed site is advantageously located with regard to transportation demands, as it is crossed by the Texas and Pacific Railroad and the Bankhead Highway. An exploration radius of two miles with Judkin Station as a center is recommended.

Under the terms of the Act of Congress authorizing the Government's potash program, the Bureau of Mines is required to negotiate leases with all land owners and holders of mineral rights within a radius of one mile from a point selected for the drilling of a test hole. The drilling program in a particular area may, therefore, be blocked by the failure of any land owner or holder of mineral rights to accept the terms offered by the Government.

Where Feldspar Comes From

A considerable part of the supply of feldspar annually available for the ceramic and other feldspar consuming industries in the United States is mined in Canada, states the Bureau of Mines, Department of Commerce. According to reports of the Dominion Bureau of Statistics the Canadian shipments—all from Ontario and Quebec—amounted in 1925 to 23,189 long tons, valued at $214,479, or $9.25 a ton, a decrease of 42 per cent in quantity and 40 per cent in value compared with 1924. The sales of Canadian spar ground in the United States in 1925 constituted 13 per cent of all ground spar sold in this country in that year, a proportion about the same as that for several years preceding.

Besides the United States and Canada, Germany, Norway, and Sweden are the chief producers of feldspar. Although the United Kingdom has an immense pottery industry, it appears to be a small producer of feldspar. Cornwall stone rather than feldspar is extensively used as a flux in the British pottery industry.

Probably all the feldspar consumed industrially, except that used for facing cement work, for covering prepared roofing, for "chicken grits," and like purposes, is prepared by fine grinding. Even for such uses the spar is at least crushed to small sizes and more or less graded by screening.

Further details regarding the feldspar industry in this country and abroad are contained in the Bureau of Mines publication "Feldspar in 1925" by Jefferson Middleton, which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

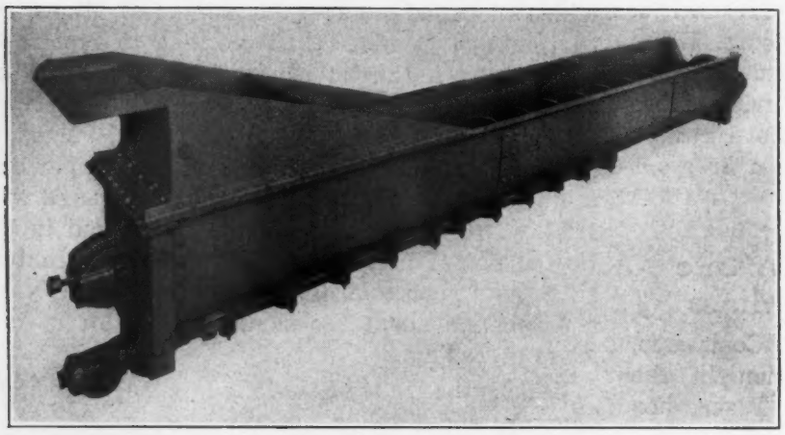
Canada Gypsum Heavily Consumed

The Canadian maritime provinces will produce as much gypsum in 1926 as in 1925—probably a little more. Since 1872 a total of 9,000,000 tons has been turned out. In 1925 the output was 471,000 tons, three-fourths from Nova Scotia. New Brunswick exports much gypsum over the line.

The remarkable popularity of new building material, of new uses for old material and of even half tested synthetic products in the Western prairie building trade, made the Winnipeg market a pioneer for building novelties long before the war.

New Eagle Sand Washer

A new sand washer has been developed by the Eagle Iron Works which has proven very successful. It was found the gravel washer was not adapted to sand on account of the loss of material. The features of this sand washer are: Complete dewatering by increased length; greater pathway for discharge water on the side not affected by screw action of conveyor by square side; and additional height and baffle plates at rear end making a dead space free from currents causing floating sand to settle thus eliminating the loss of sand in the discharge water.



New Eagle Sand Washer

Roberts and Schaefer Improve Rotary Car Dumper

The rotary car dumper manufactured by the Roberts and Schaefer Company was designed to cut down expense in unloading and handling material transported in cars. One man operates the complete equipment and some car dumpers are arranged to dump whole trips at one time. Others dump one car at a time without uncoupling from the trip.

To dump the cars any one of three types of drive may be used, pneumatic, electric or gravity, depending on conditions. Pneumatic, comprising steam, hydraulic or pneumatic mechanism is probably the most satisfactory of the three. One advantage in favor of the use of the pneumatic drive is that it cleans the car much better, particularly where any wet, fine or sticky material must be unloaded.

In operation, the electric car-dumper is, of course, the most simple; a push-button controls the entire operation, the operator being able to stop the car dumper in any position. The gravity car dumper has several features that are important to satisfactory operation and car unloading. It can be made automatic in operation and control.

For many years, when it was desired to stop cars, it has been the custom to place sprags in the car wheels. This method was hard on equipment, required extra labor and gave considerable opportunity for accident. To remedy this condition this company has introduced a mechanical spragger by the use of which cars can be positively brought to rest on a steep grade, where it would be difficult and dangerous to depend on hand spragging. The spragger is operated either by a man stationed at the machine or through remote control by an employe having other duties to perform.

Osgood 1¼ Yard Shovel

The Osgood Company recently designed and placed on the market a 1¼ yard shovel. This machine was developed owing to an increasing demand for a larger gasoline or electric shovel than their 1 yard. The machine is of heavy solid construction. Very liberal sized shafts of hammered or alloy steels are used. All the hoisting and swinging machinery is mounted on the single massive cast steel center member and a bolted-on structural steel platform extends from the sides and rear. The center member, carrying the upper body structure, moves on four conical rollers which may be removed from below, or from above, through large holes in the center casting, without shifting or jacking up the upper body. The conical rollers are adjustable in and out. A center shaft carries the propelling power from the upper body down to the truck. This shaft is removable either from above or below.

In addition to shovel work, this machine is designed for service as a crane, with hook block or clamshell bucket, and as a dragline excavator without the necessity of making any changes or additions to the operating machinery, the only change being the booms and buckets.

The continuous tread truck is rugged and simple in construction and operated with an enclosed gear drive running in heavy oil. The shovel is steered from the upper body, in any position, with ability to turn gradually or on the machine's own axis. The tread links are made with high flanges which guide and align the belts and in addition take the propelling drive from the driving tumblers or sprockets.

The machine is operated by four friction clutches. These are of the outside contracting band type and are easily adjusted and renewed. A simple wire rope mechanism is used to operate the shovel crowd. It is self adjusting to all boom angles and involves no chains or other complications. The dipper is made with its front of tough, wear-resisting manganese steel. The teeth, which are removable can be supplied either inside or outside types. The dipper handle is built up of selected white oak members, each armored on both sides with steel plates and on the top and bottom with steel bars. The boom is also a combination wood and steel type, built up of oak side members, steel armored, with oak filler, all thoroughly through-bolted. The side members are armored outside, top and bottom with full length steel plates and bars, and the inner surfaces are fitted with steel wearing plates.

Power is supplied to the gasoline shovel with a special Osgood 6 cylinder engine complete with accessories which include a self starter. The cab is an all steel structure with enclosed front. The gasoline tank is also designed to act as a counterweight, is made of cast iron, the center being made hollow. This tank will hold 75 gallons and is built into the upper body so that it becomes an integral part of the machine adding strength and solidity to the deck structure.

New High Lift Boom For Speeder Shovels

A high lift boom has been developed by the Speeder Machinery Corporation for use with the Speeder half yard shovel. This boom is eighteen feet in length, with a thirteen and a half foot stick. Increase in clearances and dumping radius is secured for basement excavation and similar work. A complete steel house, enclosing all sides, is now standard equipment on Speeder shovels and cranes. This cab is provided with plenty of openings, and may be securely locked up at night.

New Manierre Loader

The Manierre Engineering and Machinery Company have developed a wagon loader known as type W, which is most interesting. The first of these machines was put into operation about two years ago but several improvements have been made since that time. The machine requires only one man to operate and is capable of loading all kinds of loose material into wagons.

The machine was tested for loading clay from an embankment 4 feet high and 6 feet wide at the base. This material was removed easily with the machine although a considerable proportion of heavy foundation stone was in the deposit.

The loader is distinguished by three features: The 6 foot wide shovel which pick up a half ton of material allows it to slide out on to a shaker pan which feeds it to the head of a 7 foot by 2 foot 6 inch shaker screen; the screen which consists of a Hendricks slotted cascade perforated plate, and the third feature which is a conveyor that runs sideways from under the screen and is capable of piling 20 tons at the side of the machine without interfering with the operation of the machine.

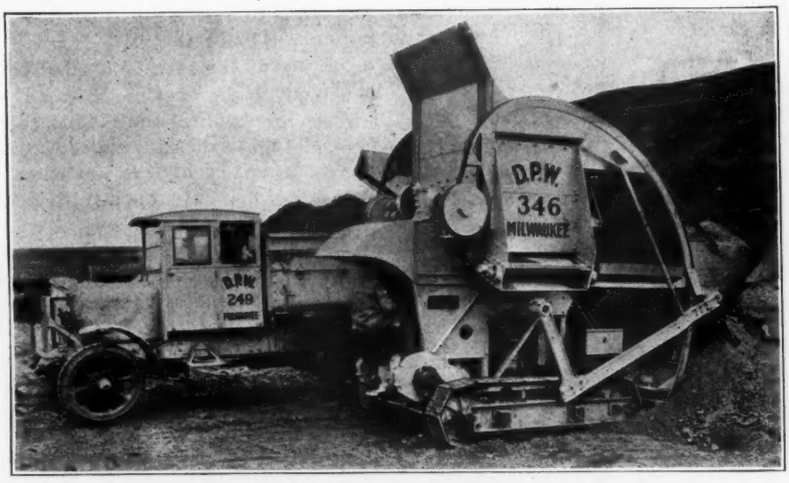
Gay Improves Its Separator

The Rubert M. Gay Company, Inc., has made a number of structural improvements in the GAYCO dry centrifugal separator during the past year and have added a new small machine to the line.

This new separator is 5 feet in diameter, requires only about 3 h.p. to operate, delivers products at any mesh from 60 to 350 and has a surprisingly large capacity for so small a unit, ranging from 2½ tons per hour at the coarser meshes to about ¼ ton per hour at 99½ per cent through the 325 mesh.

Climax Develop Service Pump Drive

The Climax Engineering Company have developed a service pump drive to be used on Climax engines operating sand pumps. This consists of a pulley of 8 inch diameter by 4 inch face, located at the front or radiator end of the engine. The pulley is belt connected to the force pump used in connection with the main pump. There has been a growing use of Climax power units for driving sand pumps and the new service drive has been designed as an aid to those concerns that have need for this equipment.



New Manierre Loader

Power for the machine is from a Fordson engine and Ford parts are used wherever possible. The hoist clutch of the shovel is automatically tripped so that the machine is foolproof. The caterpillars have 12 inch wide shoes running on five truck wheels. Lubrication is by Alemite grease gun except where the gears are enclosed and running in oil. The width of the conveyor trough is 42 inches with a 36 inch rubber belt conveyor bolted to steel cross slats with short pitch roller chains on each side. The weight of the machine is approximately eight tons.

Mead Morrison Crawler

The Mead-Morrison Manufacturing Company has recently published bulletin number 131 describing the Mead-Morrison half yard shovel crane. This shovel is equipped with live boom which has two outstanding advantages. It allows the operator to place the shovel at any desired point and thus limit the depth of digging without affecting the pull on the shovel. It gives a deep excavating range yet, without loss of time, permits the shovel to be dumped into a truck which is on a higher level than that on which the crawler is working. This combination of deep digging and high loading means faster operation and a wider range of work.

The cable crowd used on this shovel is powerful and effective, yet simple and easily controlled. It puts the full power of the engine back of the shovel plus the weight of the live boom. The two work together at the will of the operator yet each is independent of the pull of the shovel drum. The crowd is quick and positive, the pull back is speedy, one-third faster than the crowd.

The shovel is full revolving with any of the attachments. The full swing coupled with the live boom minimizes moving of the crawler. For long periods it can be held in one position, digging close by or at a 30 foot radius yet loading the trucks rapidly. This flexibility of operation increases the range of work which can be handled economically and adds to daily tonnage. The machine is a one man operation shovel, all work is handled by the operator without moving from his seat, who has an unobstructed view of the work at all times. Attachments for the one-half yard crawler are shovel, ditcher, clamshell, crane hook, dragline and skimmer. To make the machine suitable for operating any of these attachments, two of the friction drums are arranged in a standard way similar to the ordinary contractor's hoist. The third or forward drum, however, is equipped, in addition to its regular friction clutch, with planetary gearing, one dead-ended brake, and one automatic service brake at the opposite end of the drum. This combination effects reversal of the drum for high speed pull-back of shovel, ditches, skimmer, or dragline. Any of the various boom units can be installed without change in the rotating or travel units except for re-reeving of the ropes.

The crawler is equipped with automatic service brakes. These hold the load automatically, giving complete control of the drum with one lever only. Direction of rotation and travel is controlled by two interconnecting foot treadles. At the operator's right hand a gear shift lever is conveniently placed for changing from rotation to travel or vice versa. At his left is a track control lever for steering, at his right heel is the brake pedal to check rotation. This effective control speeds up the work and increases the crawler's daily production by enabling the operator to crowd his machine to the limit all day with minimum fatigue. The machine can be driven on to a flat car under its own power for shipping. Similarly it can be driven on to a trailer and moved by truck without dismantling.

Milburn Developments

The Alexander Milburn Company recently developed the Milburn Type D spray gun for all grades of paints, enamels, lacquers, varnishes, etc. A series of interchangeable nozzles are furnished which adapt the gun to very fine or coarse painting operations. This is a triple-purpose gun for use as a siphon-feed, pressure-feed and gravity-feed paint spray.

The construction of the spray allows the gun to be used on low air pressure, approximately 25 to 60 pounds. The multiple head permits either a flat spray, round spray or air for dusting. By simply turning the atomizer head the flat spray is made to issue either horizontally or vertically.

This company has also recently introduced an illuminating gas cutting torch and an oxy-illuminating gas cutting torch. The former is a low pressure torch specially developed for use with city gas or natural gas. It insures a correct and intimate mixture of the gases resulting in super mixing and great efficiency. It performs practically all the cutting operations within range of the process especially heavy plate, casting visers and billets.

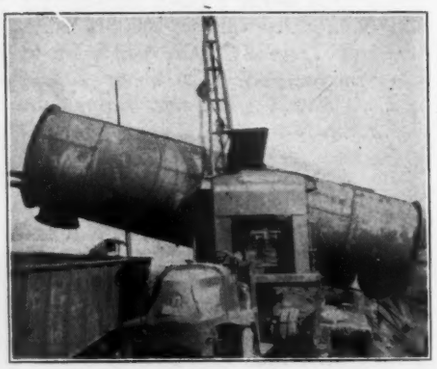
The latter torch also operates on city gas or natural gas at a pressure of 4 to 5 pounds. However, this torch has a superheater which heats and expands the cutting oxygen, also the preheating gases, raising the temperature of the cutting oxygen to approximately 100 degrees centigrate prior to combustion. This increases the temperature of the gases at the torch tip, increases the rate of flame propogation in the burning mixture and reduces operating costs.

New Universal Units

The Universal Crane Company announces the manufacture of two cranes of heavier capacity, the 7 and 7½ ton units supplementing the popular 5-ton Universal. The 7 and 7½ ton units are rated at 10 foot radius at 12,000 and 15,000 pounds respectively. Their development is the outgrowth of a demand for the mobility, adaptability and all around speed of the 5 ton Universal in a heavier capacity unit.

The illustration shows a boiler weighing 16,600 pounds, or a little more than 8 tons, being lifted from its setting, moved about 100 feet and loaded into the cars. The entire job took approximately three and one-half hours.

The appearance and size of the new units is the same as the present 5 ton crane. The same general design and high-grade construction have been used throughout. They are full revolving unit with a swing speed of 6 f.p.m. the rope speed is 140 f.p.m. The units are gasoline powered with a 44 h.p. Waukesha motor and are one-man operated. Only three levers and one foot pedal are used to control various swinging and bucket operations. These units are furnished for either clamshell or dragline bucket operation with booms of various lengths suitable for different job requirements.



Universal Crane

Several of these units have been in service in the hands of contractors for six months to a year and it is only after this most rigorous testing that these units are offered to the construction field. The units are suitable for motor truck mounting, crawler, railroad flatcar, trailer, etc., and possesses the same advantages of the 5 ton crane in being readily transferable from one mounting to another.

Ideal Induction Motor

The Ideal Electric and Manufacturing Company recently developed a double-squirrel cage automatic across-the-line induction motor known as type AA. This machine is an improved type of automatic self starting induction motor and accomplishes in a magnetic manner what heretofore has been done automatically.

This motor is simply a standard squirrel cage induction motor with a double squirrel cage winding in the rotor. The outer squirrel cage winding in the top of the rotor slots has about ten times the resistance of the second squirrel cage in the bottom of the slots and functions during the starting period to give high starting torque with low inrush of current from the line. At the start the frequency of the rotor current is the same as the stator or line current but gradually becomes less as the rotor begins to revolve and becomes zero at full speed. Thus the transition or change over from the starting to the running condition is accomplished magnetically or simply by a change in the reacton of the rotor.

A single throw switch, or its equivalent in a circuit closing device is all that is necessary to effect the starting of these motors. Also they require no skilled attendant or manually operated device. Because of these facts they can be started with the same satisfaction from some distant point by closing the current supply circuit. The motors are built in any size from 3 to 100 horsepower and larger if so desired.

New Flory Hoist

The S. Flory Manufacturing Company expect to place on the market, in the near future, a new type of two speed hoist arranged for either electric motor or gasoline drive.

This hoist will ordinarily be equipped with two drums placed tandem, the rear drum being equipped with a single gear and friction. The front drum will be supplied with two sets of gearing and two frictions; the frictions being of improved asbestos cone type, operated by the Flory non-heating friction clutch mechanism, and each equipped with a positive releasing device. The two sets of gearing on the front drum will be designed to give alternative ratios of about 2½ to 1. For instance, the 50 h.p. hoist will have a heavy duty low speed capacity of 5,500 pounds on a single line at 175 feet per minute. The high speed gearing and duty will give a capacity of 2,400 pounds single line pull at a speed of 400 feet per minute. All levers will be banked in a battery at the rear of the hoist. A silent chain drive will be used between the motor and intermediate shaft. In this design, the drum can be engaged from high to low speed or vice versa, without stopping the motor and under load.

The hoist is specially adapted for medium duty slack line excavator work and also for general construction and material handling specifications where it is desired to handle two classes of duty requirements with the same machine.

New Armstrong Bit Dresser

The Armstrong Manufacturing Company recently introduced a new and larger bit dressing machine. This machine to be known as the Armstrong number 8 bit dresser, is built to handle drill bits up to 8¼ inch and was designed especially for users of blast hole drills, making holes 6½ inch or larger. It is a duplicate of the number 6 machine as regards general design and principle of operation, but is built more durable to handle the heavier work. Both the number 6 and number 8 Armstrong bit dressers are used extensively by quarrymen and have resulted in a great saving of time and labor to these operators who heretofore have been accustomed to dressing their bits by hand.

Browning Truck Crane

The Browning Crane Company has recently designed and developed a gasoline truck crane which is especially adapted for use in loading from pit, into cars, into stock piles, for reclaiming, stripping, removing over burden, loading hoppers, and charging gravel plants. The crane is a remarkably rugged compact portable handling outfit which combines all of the features developed during twenty-six years of locomotive crane engineering. All working parts are interchangeable, with the number of these parts kept at a minimum. All parts are made well over strength to assure longer service and a minimum of replacement.

The control of the Browning truck crane is centralized at the operator's position in the front of the cab so that every control is directly in front and within easy reach of the operator. This system of centralized control has been worked out so that the levers which are used the most are placed in such position as to require the least amount of effort on the part of the operator.

The specifications of the Browning truck crane are as follows: 2 power drums with outside band friction clutches; 2 automatic brakes; 20 or 30 foot boom; 45 h. p. 4 cylinder Climax engine, Model KU; trolley and track; deep bucket from swing; ¾ steel house; all working parts of forged or cast steel; weight of crane with sub-base ready to mount on truck approximately 12,000 pounds; hoisting speed single line, 5,000 pound load, 150 f.p.m.; hoisting speed 2 parts of line, 10,000 pound load, 75 f.p.m.; rotating speed up to 3.5 r.p.m.; the Dot system of lubrication is used throughout.

Miami Trailers and Scrapers

The Miami Trailer-Scraper Company have recently developed a new trailer especially for use in connection with tractors. However, it may be used in connection with trucks provided the speed of the truck is held down to 10 or 12 miles per hour.

This unit has a carrying capacity of 2½ tons. The unit is of all steel construction. It is equipped with steel wheels and each wheel is equipped with two Timken tapered roller bearings giving the unit an exceptionally light draft. It is built for an extremely short turning radius of the cut-under type so that the trailer may be turned in its own length. The front wheels may be turned completely under the trailer even with the doors open. The front gear construction provides for the tilting of the front wheels sideways in mounting obstructions to either front wheel.

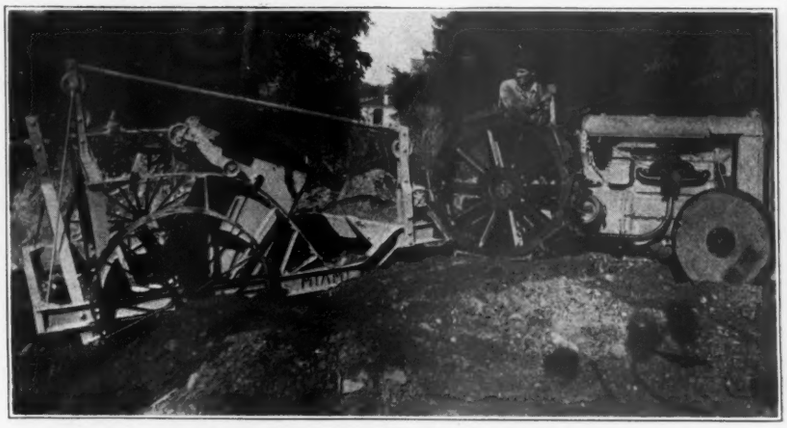
The Timken bearings used in the wheels are of the tapered type and provide fully against end thrust both inward and outward. The wheel hubs are machined to very close limits for Timken bearing equipment, a felt washer being mounted in a groove on the inside shoulder of each spindle and a hub cap fitted to the outside hub flange insuring fully a dirt proof hub.

The lubrication of the wheels is accomplished through Alemite nipples making it unnecessary to remove the wheels except for the occasional cleansing of the Timken bearings. The drawbar is constructed for attachment at any height so that these trailers may be coupled in trains of two or more by mounting a towing hitch connector to the rear cross member of each trailer.

The body construction of this trailer is unique, the dumping doors being hinged directly to the chassis frame or channel. This construction results in a very low loading height from the ground to the top of the body being only 56 inches in the 1½ yard trailer and 61 inches when mounted with a 5 inch top box which gives the trailer a water level capacity of 2 yards. This low loading height is of great importance for hand shoveling or for use under power shovels. The dumping and winding device is located at the front end of the trailer on the right hand side. The dumping lever can be operated by means of a rope from the tractor driver's seat. The winding lever is so constructed that it will close the doors in less than five seconds time.

The trailer is regularly furnished in the 1½ yard water level capacity. The unit, however, may be equipped with an extra ½ yard top box giving it a water level capacity of 2 yards. This trailer is so constructed that the body, the bottom doors and the winding and dumping device can easily be removed giving a trailer chassis on which can be mounted a platform body for general hauling purposes. The trailer thus becomes a two in one unit.

The illustration shows a Miami one-man power scraper. This company has a large number of these scrapers installed in gravel and sand pits throughout the country. The question is sometimes asked as to whether or not the Miami scraper could be used for dumping dirt back into the pit from where the gravel or sand had been removed. The answer is given very clearly in the illustration. The machine is being used for removing the overburden from the gravel layer. This overburden is then hauled to a dead end of the pit and is backed over the edge of the pit into a position for dumping so that the dirt will roll down the bank into the hole.



New Miami Unit

Helgerson Tractor

The Helgerson Foundry Company manufactures the Helgerson's little locomotive tractor. This machine was designed to do light hauling economically and rapidly. It consists of an attachment to convert a Fordson into a locomotive. It is claimed that the little locomotive will do the work of four teams of horses, and requires only nine gallons of kerosene for ten hours' operation.

One great advantage possessed by the machine is that it is adaptable either to road or rail work, the change can be made easily and quickly. The little locomotive is simple to operate as the inherent simplicity oft he Fordson has been retained, and the locomotive attachment does not interfere in any way with its ease of control. Another advantage is the easy accessibility of the various parts, most of which being obtainable at Ford repair stations when repair parts are needed.

This locomotive is made in 30, 36, 42, 48 inch and standard gauge, the 30 inch being found to be the narrowest gauge on which this machine could be used.

Traylor Improvements

During the past year, the Traylor Engineering and Manufacturing Company has introduced a number of refinements in the design of their bulldog jaw crusher and cement-making equipment, which have resulted in a decrease in the cost of operation with a corresponding increase in efficiency.

On the crushers one of these, constituting an added feature, is a safety device which guarantees the user freedom from the danger of serious breakage of the machine in case overloading develops through packing or the accidental introduction of tramp steel in the feed. The device is of a simple character, consisting of a small steel plate and a hardened steel punch, set into a recess in the rocker which forms the support of the front toggle plate. The placing of the punch and plate are such that when a dangerous strain is placed upon the crusher, sufficient to overcome the shearing strength of the plate, the punch is forced through the plate, the toggles drop a short distance and the machine is put out of action.

The plate is chosen of a thickness having the yield point well within the line of safe operating strain, which is determined by the design. The punch is not injured when yielding takes place and the plate may be replaced in a few minutes, enabling resumption of crushing with very little delay.

It has always been difficult to correctly line up the supporting rollers of a rotary kiln, during the process of erection, and equally troublesome has been the problem of maintaining the alignment in operation. The reason, lies in the cradle design of support, with its double rollers which are very hard to align, particularly because they cannot assume their correct position until the shell is resting upon them, when fine adjustment of the position of the bearings is rendered difficult by reason of the great superimposed weight.

All of this is overcome by the simple expedient of mounting the shell upon the new Traylor design single rollers, set in rigid bearings securely bolted to very substantial structural steel frames. By this construction, correct alignment is easily secured before the shell is placed in position and adjustment during operation is equally facile.

The lubrication of the roller bearings is by oil and is automatic, being accomplished by oil elevators or bucket wheels mounted on the roller shafts at the outer ends. The lower buckets of the oil elevator are submerged at all times, and the oil is carried to the top of the shaft and discharged on to a spout extending to the center of the journal, and floods it. In the oil reservoir are placed pipe coils for water circulation, to maintain a proper temperature of the lubricant, and suitable seals are provided to prevent its escape or the entry of dirt.

The Traylor compartment mill has been improved in several respects, particularly the diaphragm and the trunnion bearings. The diaphragm screen is made in sections with the bars cast en bloc, instead of the separate bar forgings formerly used. This design enables the operator to make replacements more rapidly. The trunnion bearings are oil lubricated, being of the same design as that described for the rotary kilns above. This type of bearing is particularly well adapted for use on compartment mills because of the very heavy load that must be carried, which makes it difficult to be assured of adequate and continuous lubrication.

The year, for this company, has been featured by the large units of cement-making equipment which have been furnished, and which clearly indicate the trend of the industry toward greater capacity and finer grinding. All of the kilns and mills furnished by Traylor during 1926 have been larger than those previously built and to two prominent cement manufacturers have been furnished the world's largest of their kinds.

One of these companies is using two kilns 11 feet 3 inches diameter to 10 feet 0 inches diameter by 343 feet 9 inches, built on five supports of the new single roller design. The other has purchased one kiln 11 feet 3 inches diameter by 300 feet 0 inches diameter on four single roll supports, together with two 8 feet 0 inches diameter by 40 feet 0 inches and one 8 feet 0 inches diameter by 30 feet 0 inches three-compartment mills. From inquiries now being received, the indications are that, in 1927, not only will units such as these supplant present equipment, but still larger will be demanded by the industry.

Universal Vibrating Screens

The screens made by the Universal Vibrating Screen Company have been on the market for six years. During the past year this company's engineers have been testing and perfecting what will be known as the improved type "C" screen. It is claimed that all the advantages of former models have been retained in this new unit, while many improvements have been made.

The same efficient and dependable mechanical vibrating means is employed, with improvements in bearing design which makes these parts absolutely dust-tight. The vibrating frame is constructed entirely of pressed steel, which gives the very necessary light weight for the highest screening efficiency and the greatest strength to withstand severe service.

The method of maintaining the proper tension on screen cloth has also been changed to allow for quick changes of screen cloth. With this new duplex clamping arrangement the screen cloth sections can be changed very easily in five minutes time, and tension on the wire cloth is uniform over the entire screening area so that there is absolutely no chance for dead areas.

Improved Type Universal Screen

The center strip and channel which supports the screen cloth against the weight of material and imparts additional vibratory action through the center of cloth, keeping the screening action at a uniform intensity, is not bolted to screen cloth as on earlier models. A pressed steel channel, a part of the frame itself, runs the entire length of screen frame, through the center, and is rigidly secured to the pressed steel bottom cross members. Four small jacks lock the center strip in position so that the screen cloth is clamped between it and the longitudinal center channel. These jacks can be released and the center strip removed quickly when a change of screen cloth is made.

The new screen requires less space as it has been made narrower, lower and more compact throughout, and at the same time an increase in percentage of screening surface has been accomplishd. A very neat and attractive 24 page catalog has been prepared, describing this new improved vibrating screen in detail. It contains many drawings and suggestions for screening arrangements.

White Tractor Hoist

The Oklahoma Engineering and Foundry Company has recently issued a catalog describing the White Tractor Hoist which this company manufactures. This hoist was developed by an engineer who used hoist continually in construction and re-construction operations. However, at that time there were no portable hoists manufactured and he was obliged to use cumbersome steam and occasionally electric hoists. This was both expensive and often very inconvenient.

In order to overcome these difficuties the White tractor hoist was designed and after several years of experimenting this design was conformed to suit the Fordson motor where it is attached to the rear axle.

The hoist is built into and becomes an integral part of the Fordson tractor and installation can be made in four hours or less. It is so designed that it will not interfere with any of the other uses to which the tractor may be put. It can be used with any type of wheel adaptable to the Fordson and any type of four-wheel trailer or two-wheel trailer; manufacturers of two-wheel trailers making a special saddle adapting their trailers to this hoist.

In operating the hoist, the operator sits in the seat and faces the work at all times. All moving parts, except the drum, are enclosed insuring safety to the operator. As the drum revolves on the housing, there is no danger of losing the load, additional protection being afforded by a specially designed positive foot brake.

The load capacity and lifting speed, when using standard gearing, is 5000 pounds at 120 feet per minute. When using a Smith unit or standard Fordson with a White heavy duty take-off the high speed is the same as that given with a low gear capacity of 10,000 pounds at 60 feet per minute. The lowering speed is optional with the operator and is controlled by two brakes operated by foot direct on drum or by lever and ratchet on the countershaft. The hoist derives its power from the standard pulley attachment from which a sprocket and chain transmit the power to a chrome nickel countershaft, which in turn drives the drum with sliding pinion. The chain is housed in a steel casing which not only protects the operator but is also a receptacle for oil, which lubricates the chain. These hoists are made in the following types: Standard single drum; Standard double drum; 20 inch single drum; double drum oil feed special; 13 inch reversible drum; contractor's special and bailing special.

Fundom Shovel

The Fundom Hoist and Shovel Company has recently developed the shovel shown in the illustration. This machine was designed and is built to meet the demand for a small shovel for excavating. The design is simple and the shovel is made with the fewest possible parts. Therefore as there are fewer parts to wear, less power is required to operate the mechanism, and more power is available for digging.

In construction only the best materials are used. Its sturdy design, rugged construction and great speed enable the shovel to do all kinds of digging and it can handle average sized and small jobs efficiently. It is strictly a one man outfit. The shovels are equipped with either gasoline or electric power. The gasoline shovel uses a Fordson tractor complete with governor. For the electric shovel a 25 h.p., 900 r.p.m. high torque heavy duty motor is employed. The arrangement of the shovel mechanism and drive is the same in both cases.

Some of the features of construction are as follows: Alemite high pressure system is used on all the bearings. The clutches are double faced and thermoid lined. The boom is constructed of 8 inch channels reinforced with plates and ties and is 12 feet long. The mast consists of two 6 inch channel members fastened at the lower end on a yoke casting; upper end supports the mast head casting. The crowding mechanism is operated by a double-pad thermoid lined clutch driving link chain to support shaft, which is provided with two steel pinions meshing with steel racks on the dipper handle.

The travelling speed is approximately three miles an hour. The controls consist of three hand levers and two foot pedals, all conveniently located, and control all the digging operations. The boom will travel a full ¾ circle. The traverse is moved by worm and worm gear driven sprockets which mesh with a stationary link chain provided with a shock absorber. The capacity of the shovel is 10 to 30 cubic yards an hour, depending upon working conditions and materials handled. The capacity of the dipper is ⅓ yard when filled level.

The crawls are of steel construction, flexible, rugged and heavy, the treads being cast steel and are driven from the Fordson tail screw. The dipper is of heavy plate construction and is equipped with manganese steel rooters having reversible and replaceable points. The dipper stick is made of two 6 inch channels 9 foot long, provided with stiffeners.

The general dimensions of the shovel are: Length over all without boom 14 feet; width over all 6 feet 8 inches; height from ground to top of mast 9 feet 3 inches and approximate weight 7 tons.

Waukesha Improvements

During the past few months the Waukesha Motor Company, builders of heavy duty automotive type industrial power plants, has been delivering a still larger unit developing 120 horsepower. This unit has a four cylinder engine of 6¾ inch bore and 8 inch stroke, and governed at 850 revolutions per minute. It is equipped with the well known Ricardo head, a new combustion chamber design.

All Waukesha engines are now equipped with this head which increases the power and reduces fuel consumption of an "ell" head engine without causing "ping." Due to the demand for more power from Fordsons in industrial and highway work the Waukesha Motor Company now furnish a replacement head for Fordsons which gives from 3 to 5 more horsepower, and makes it possible to do much work on high that could not be done before. These heads have no moving parts or require special fittings and can be installed in an hour.

New Waukesha Power Unit

Non Clog Dixie Mill

The Dixie Machinery Manufacturing Company two years ago installed in one of America's largest cement plants a Dixie hammer mill with a rotating or moving breaker plate designed to eliminate clogging and sticking, which were the troubles with the gyratory, roll or jaw type of crushing machinery. This hammer mill has now crushed about a million tons of very hard limestone, containing a considerable amount of mud or clay, which are embodied in seams found in the quarry. During the crushing of this amount of rock, not once has there been a shut-down due to the hammer mill, and during this period, a considerable amount of labor was eliminated that was formerly used to push this material through the gyratory, and roll type of crushers.

Dixie Hammer Mill in a Cement Plant

Bay City Tractor Shovel

A new Bay City tractor shovel, manufactured by the Bay City Dredge Works, was recently introduced to the industry following a period of severe and exhaustive tests. This shovel which is ½ yard capacity has been developed to provide a smaller machine for operators who find the model 16-B, ¾ yard too large for economical use.

This new shovel was designed by an experienced shovel engineer, with the idea of providing sufficient tractor power to meet any emergency. The best methods and materials are used in its construction, the company manufacturing them having had many years of experience in the dredging and excavating field. Power is supplied by a McCormick-Deering tractor and provides three speeds through the medium of a selective transmission, the fastest speed is 3½ miles per hour.

In the construction of the machine special steels with alloy shafting forged, heat-treated and machine-cut gears and Timken roller bearings have been used. A revolving bull-wheel, placed above the machinery frame, supports the entire operating machinery. Therefore, as the machinery revolves the operator moves at the same time and the machinery, including the excavating medium, can swing through an arc of 270 degrees. This three-quarter circle swing permits full circle utility and part circle economy. Material can be dug and loaded with the shovel opposite the rear end of the crawlers.

When operating as a shovel the bucket can make five trips per minute. The crawler treads are 9 feet long, constructed with tread rollers, which are enclosed to keep out dirt. Similar care has been given to the operating machinery, gears and bearings which are also enclosed under a removable metal hood for protection from weather and dirt.

The machine is strictly one-man operated and when desired can be operated by kerosene instead of gasoline. A steel worm and bronze worm wheel, running in oil, and connected with the machine by shafts and gears is used to obtain the crowding motion. The shovel boom is 15 feet long, permitting the shovel to cut at a height of 17 feet, or dump at a height of 15 feet.

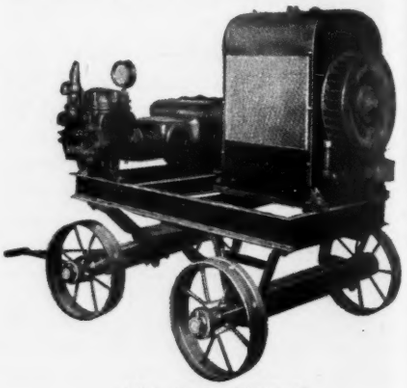
The tractor shovel can be quickly and easily converted into a crane, dragline or clamshell by removing the shovel boom and crowd and putting on a 25 foot crane boom. Either shovel or crane is provided with a power boom hoist mechanism. It is felt that this machine will fill long felt needs for a light, small and fast convertible excavator. It can be used to advantage on such work as general excavation, loading or unloading cars, loading material from stock piles, excavating or back filling small sewers, etc. Owing to its travel speed, 3 miles in less than an hour, it is a handy machine for use on small jobs where the installation has to be moved from one location to another.

New Cook Units

Operators in this field will be interested in a new compact electric plant which is being manufactured by The Cook Motor Company. For lighting quarry operations, night work in gravel plants, or other operations where good light is required, the Powermaker electric plant is an ideal unit; being portable, it makes an ideal unit for emergency work as it can be easily and quickly transported to any location where night work is necessary. It also makes a convenient unit for standby or emergency service.

This compact electric plant is powered by a two cylinder, fully enclosed engine, which operates on either gas, gasoline or kerosene. The engine is direct connected throught a flexible coupling to a 5 or 7½ KW ball bearing generator. The whole unit, which includes the engine, generator and switchboard, is mounted on a rugged, hot riveted channel iron base. The unit can be furnished mounted on wheels if desired.

A new gasoline engine driven centrifugal pumping unit has also been announced as another development of this company. This unit is built in 4 inch, 5 inch and 6 inch sizes. The 4 inch size has a capacity of from 250 gallons per minute to 500 gallons per minute; the 5 inch from 500 to 700 gallons per minute and the 6 inch from 700 to 1,000 gallons per minute.



The Cook Motor

One of the important features of this new pumping unit is found in its heavy rugged construction. It consists of an engine, which can be operated on gas, gasoline or kerosene, direct connected to a side suction centrifugal pump. Both the engine and pump are mounted on a fabricated steel frame and can be furnished mounted on wheels if desired.

The pump is fitted with an enclosed type impeller. It is well suited for gravel washing, removing surface water and for general pumping service. There are two large bearings, one a ring oiled, the other is lubricated by a grease cup. An accessible stuffing box of liberal depth provides a means of packing that requires little attention.

A third production of this company is a new pumping unit. This unit consists of an engine, which can be operated on gas or gasoline, direct connected to a fully enclosed duplex, double acting, force pump. A rugged hot riveted steel frame forms the base of the unit, which can be furnished mounted on wheels if desired.

The cylinders have removable brass liners so that the capacity and pressure limit of the unit can be easily and quickly adopted to various requirements within the range of the pump. Another important advantage is found in a self-oiling feature of the pump. The power end of the pump is fully enclosed. The parts operate in a bath of clean oil. In fact there are only two places to lubricate the entire unit, one on the pump and one on the engine.

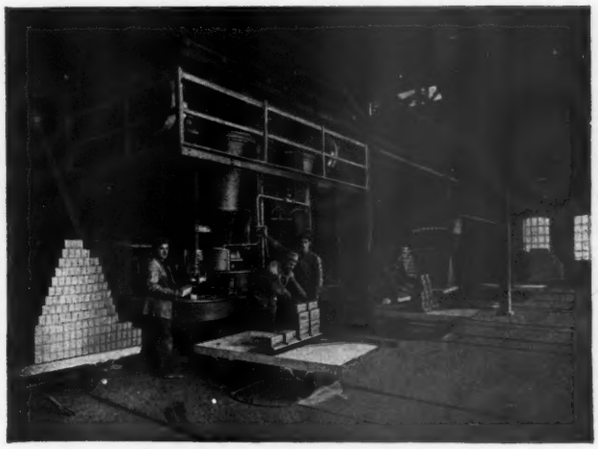
The Komnick Process

The Komnick Machinery Company has issued a catalog describing the Komnick type 1-B brick press. This machine is used to form the bricks into shape after the sand and lime has been properly prepared and mixed in the Komnick Mixing Drum and Komnick Edge Runner Mill. The bricks prepared by these machines are in reality a scientifically constructed artificial stone. The sand and lime, each of specified quality, are so proportionately put together under high pressure and so cured under steam pressure, as to constitute conditions under which natural stone is formed. The methods under which these bricks are produced is known as the "Komnick Process."

The only raw materials necessary for the production of sand-lime brick are lime and sand. The manufacture of 100 bricks of standard size requires approximately 2 cubic yards of lime in its natural state or 2¼ cubic yards of pit sand in the loose state and about 350 pounds of quick lime. Briefly, this process is as follows: The lime used is ordinary burned lump lime which is thrown into the feed funnel of a ball mill. This machine grinds the lime by means of balls located inside the mill as the mill rotates. The powdered lime passes through a fine sieve and the grits are retained to the mill for further grinding. The powdered lime collects at the bottom of the ball mill jacket and are automatically transported by a conveyor to the lime tank and weighing apparatus. When the correct amount of lime for any given number of bricks has been measured the lime is conveyed to the mixing drum. After the collected amount of lime and sand has been placed in the mixing drum the cover of the drum is bolted in place and water admitted to the drum in a measured amount as determined by test. The drum is then set in motion, making about one revolution every four seconds. A safety valve prevents the steam pressure from becoming too great. The mixing and slacking is completed in about one hour.

The mixture then passes automatically and directly into the distributing device which is attached to the edge runner mill and is thus evenly distributed below the runners which rub the sand and lime well into one another. This is accomplished by the use of low and broad runners rotating in the pan of the runner mill. After the lime and sand have been thoroughly mixed it is ready for the brick press. After the bricks come from the press they are loaded on trucks and run into hardening cylinders. The doors are bolted on and made steam tight and the bricks then remain under steam pressure of 120 pounds for eight hours or more and after being cooled down are ready for shipment.

The Komnick type 1-B brick press has a production of from 2,400 to 2,800 an hour and requires 12 horse power to operate the machine. It is equipped with an automatic feeder with regulated outlet. This apparatus is fastened to one side, near the top of the press body with a reservoir located directly over the service pan. The feeder is driven by means of an overhead bevel gear. The press is also provided with a device for regulating the flow of sand-lime mixture in pockets of the press table. The green bricks are pushed out of their moulds with a lever. This removes the brick without shock, immediately after it has been under pressure, and the mo-



Finished Product Department

Kommick Brick Hardening Cylinder

tion is of such a nature that the sharp edges on the brick are not broken off.

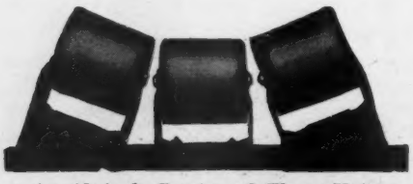
The construction of the main pressure die permits an exact vertical pressure. The die moves on steel girders insuring the die operating evenly even under extraordinarily high pressure. The die lever regulator is adjustable permitting the proper pressure to be exerted on the green brick.

In order to avoid sand falling on the press operating mechanism, which would soon injure it, all the mechanism for operating the table as well as the main die lever has been placed at the rear of the press table.

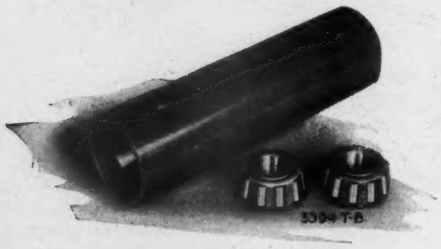
Some of the principal advantages of the press are: An extraordinarily high pressure, insuring strong sharp edged bricks; strong construction of machine; provision of automatic safety appliances which come into action and stop the press should an excessive pressure be developed or foreign body enter the press, reliable control of the filling of the press moulds, hence absolute equality of the brick produced; exact rotation of table, shockless pushing out of the brick from moulds thus retaining sharp corners.

New S-A Carrier Unit

The new Stephen-Adamson Unit, equipped for high pressure lubrication and mounted with Timken bearings is identical in dimensions and general design with previous standard S-A Carrier Units. This all-steel unit is furnished with two tapered roller bearings mounted and protected within the steel tubing hub. Labyrinth washers and a large grease seal completely exclude all dust. The tube hub holds a reserve supply of lubricant. The adjustment of the bearings is accurately maintained by a special lock screw which controls the lateral position of the tapered bearings. One high pressure lubrication fitting is provided in a convenient location for service by a grease gun.



An 18 inch Carrier of Three Units



Timken Bearing Assembly

The New S-A Unit

S-A units, Timken equipped, are made with 6 inch diameter pulleys and in two standard lengths, 6 and 8 inches long. The all-steel construction which has demonstrated its desirability through long years of service, is one of the outstanding features of the S-A Unit Carrier.

Elmes Presses

The Charles F. Elmes Engineering Works manufactures a complete line of portable hydraulic jacks, wheel and force presses in a variety of designs from 10 to 1,000 tons capacity. One of the recent developments of this company is a 325 ton tire applying press which is built to mount and demount the largest solid truck tires on the market. This unit is of interest to fleet owners not only because of its use in the service station but also because it is a portable unit and can be sent out on the job.

Truck Tire Press

Locomotive Crank Pin Press

This company is a pioneer builder of presses, and many companies in the non-metallic mineral field are using the Elmes units in mounting and demounting couplings, fly wheels, pulleys, discs, rolls, cranks, wheels, etc. A list of these concerns includes the Atlas Portland Cement Company, Santa Cruz Portland Cement Company, Lehigh Portland Cement Company, Western States Portland Cement Company, Wolverine Portland Cement Company, Missouri Portland Cement Company, Sandusky Portland Cement Company, Chicago Gravel Company, Consumers Company, Greenville Gravel Corporation, etc.

The recognized merit of the pressed on fit has rendered the old style method of shrink fits practically obsolete. Any plant equipped with a few small machine tools can do the balance of their repair work with the addition of the Elmes equipment. There is also the possibility that a repair service can be offered others at a nominal charge and thus make a profit out of a repair shop which is often considered an expense.

New Incorporations

Southern Limestone Co., Harriman, Tenn. J. N. Baker, W. C. Anderson. $60,000.

M. Orzano & Sons, Rockville Centre, N. Y. Lime and cement. 200 common, no par. A Pennisi, I. T. Longworth, J. Koppelman. (Filed by Longworth & Koppelman, 170 Broadway, Manhattan, N. Y.)

Massaro Wash Sand & Gravel Co., Fulton, N. Y. $10,000. C. and P. Massaro. (Filed by H. L. Gilman, Fulton, N. Y.)

Missouri Celite Products Co., Wilmington, Del. $500,000. Limestone, other stone.

Sampsel Gravel Co., Sampsel and Ridgeway, Mo. $30,000. Paul Doneghy, Kansas City, Mo.; E. A. and E. S. Miner, Ridgeway, Mo.; Claude Walker, Sampsel, Mo.

American Portland Cement Co., Camden, N. J. $500,000. F. R. Hansell, A. Celow, John A. MacPeak, Camden. (Filed by N. J. Corp. Guar. & Trust Co., Camden, N. J.)

Amiesite Asphalt Co. of Miss., Wilmington, Del. $100,000. (Corp. Trust Co. of America.)

White Plains Tile Co., White Plains, N. Y. $10,000. Marble. A. and C. Medeot, M. Tores. (Filed by Hayman & Goldowitz, Port Chester, N. Y.)

Klinker Sand & Gravel Co., Seattle, Wash. $25,000. J. C. Klinker, Philip and Edwin Neary.

Wolf Creek Sand & Gravel Co., St. Louis, Mo. $30,000. $15,000 paid in. Plant at Delight, Ark. E. O. Beyers, Pres.; W. Grayson, Jr., V. P. and Mgr.; J. E. Schwarz, Sec'y-Treas., Arcade Bldg., St. Louis, Mo.

Ford Sand & Gravel Co., Scranton, Pa. $10,000. To excavate, screen, wash, and sell sand and gravel. Michael E. Ford, Harold and Robert Scragg.

Super Vibrating Screen

The Simplicity Engineering Company has recently issued a circular describing the Super Vibrating Screen which it manufactures. This screen shown in the illustration is of the vibratory type, the motion being obtained by an ingenious arrangement of eccentrics which give the screen an oscillating motion that vibrates it both horizontally and vertically. It is claimed that this action not only cuts the sand but cleans the screen as well.

Through this arrangement the pebbles are constantly kept moving and rubbing against each other while in the air and on the screen surface. The result is that all adhering particles are loosened and then pass through the open meshes. The vibrating mechanical control of the vibrators, which have the same throw whether the screen is loaded or unloaded.

The screen has a very efficient and unique drive, the entire drive mechanism, shafting, coupling, gears, etc., being inclosed in castings and tubing, therefore, the operator can stand anywhere on or around the machine without the possibility of accident or injury, and the drive is made grit and dust proof. The machine will screen either wet, damp or dry material.

The screen specifications are briefly as follows: Length of screen over all including motor 8 feet; width of screen overall with motor, 5 feet 10 inches; center to center of I-beams, 4 feet 3½ inches; size of I-beams, 10 inches; length of I-beams, 11 feet; power, direct connected electric or belt drive; actual screen size 3 feet by 6 feet; capacity varies with conditions from 125 to 200 tons an hour; head room required for screens, 20 per cent screen pitch at I-beams, single deck 3 feet 6 inches, double deck 4 feet 6 inches and triple deck 5 feet 10 inches.

Brookville Locomotives

The Brookville Locomotive Company has developed a number of models of the Brookville Locomotive during the past year. These are of 3½, 4, 5, 6, 7 and 8 ton hauling capacity. The power unit for all these models is the Fordson tractor mechanism complete with the exception of wheels and front axle assembly.

The frame is made from a channel section ranging from 8 inch on the smallest unit to 12 inch on the 6, 7 and 8 ton capacity locomotives. Brakes of the dual system which consists of cast iron on all four drives and standard Fordson transmission is used. The drive is positive on all four drives, through sprockets on Fordson axles to jack shaft on Brookville reverse on the larger units and on the smaller sizes the Fordson axles merely act as jack shafts for transmitting power to the lower axles.

On the 3½ ton size, 3 forward speeds and one reverse speed is provided, and the larger units have three forward and three reverse speeds. This range of speed enables these locomotives to travel and haul loads under any conceivable condition. With the advantage of the Brookville reverse mechanism, which is entirely independent of the Fordson tractor and used on models 6, 7 and 8 tons, the three standard Fordson speeds are obtained in reverse the same as forward. Therefore, the locomotive has equal speeds and pulling power in both forward and reverse work. This permits the forward drive of the Fordson mechanism to be used at all times. While no alteration of Fordson mechanism is made the range of three speeds can be raised or lowered as desired.

During the past different manufacturers of heavy slow speed spotting locomotives with Fordson power unit have carried a heavy percentage of locomotive weight on the Fordson axle shaft. This excessive weight combined with side strain when negotiating curves has resulted in Fordson axle trouble.

Lincoln Arc Welder

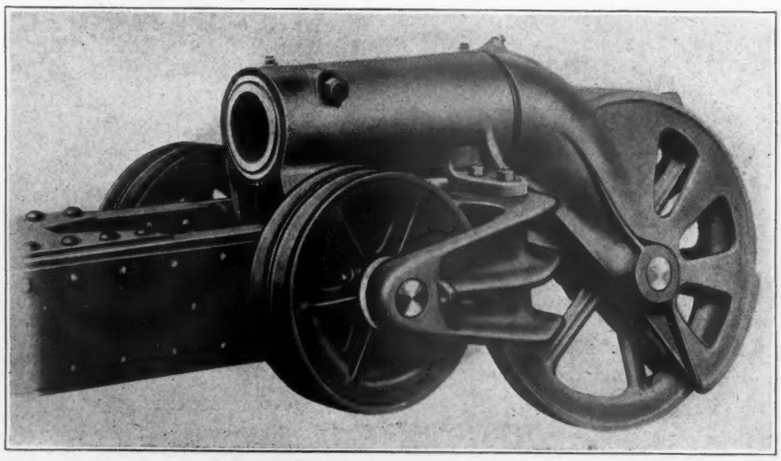
Rapid extension of the field of usefulness of the electric arc welding process has brought out equipment which is particularly adaptable to the service required of it. Electric welding permits a great deal of work being done without dismantling the equipment being repaired. For this reason, it is advantageous to be able to bring the machine to the work. This is illustrated in the case of breaks in the main frame of a steam or electric shovel. With the electric arc process the necessary welds are made without even moving the equipment and in many cases within two or three hours. Building up manganese steel parts of crushers without removal is also a job which requires moving the welding machine to the job.

Where electric power is available, an electric motor driven arc welder is the best thing to have. Initial cost is relatively low and operating and maintenance costs are low. The illustration shows an equipment made by the Lincoln Electric Company for operations similar to those noted. The machinery is mounted on a steel truck and protected against all kinds of weather. This company also manufactures a gasoline driven electric welding equipment. The engine is a very heavy duty truck engine and may be operated safely by anyone who is familiar with gasoline engines.

Koehring Development

The Koehring Company now offers a swivel type of boom point fairlead on its dragline excavators where sloped bank work is necessary. This is a new type of fairlead for the boom point. By permitting the fairlead sheave to swing at will, the cable pulls directly over the center line of the sheave at all times, irrespective of the position of the bucket. All cross pull and friction between the sheave face and the cable is eliminated. In addition to giving longer life to the cables, it saves the swing clutches and increases the speed of operation. The operator finds it possible to drop his bucket on the right spot without giving his attention to the exact position of the boom.

The Koehring swivel type of boom point consists of a swivel sheave casting which journals in a cylindrical bearing. The bearing is rigidly supported by the boom point yoke which in turn is bolted to the tip of the structural steel boom. This type of point is interchangeable with the regular boom point construction and can easily be put on in this field.



New Type Koehring Swivel Boom Point

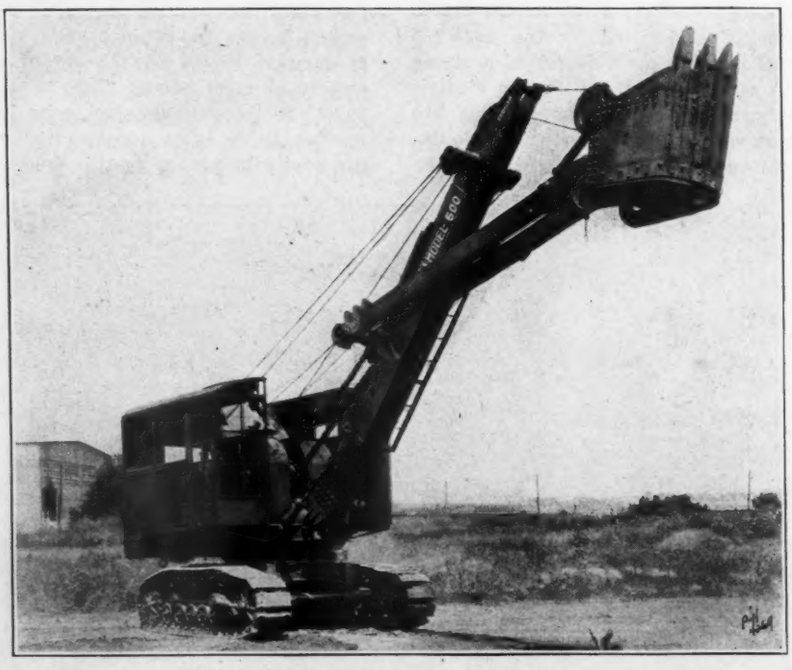
New P & H Excavator

The Harnischfeger Corporation has recently developed a new type P. and H. Excavator known as model 600. These new models, built in sizes ½, ¾, 1 and 1¼ cubic yards capacity, are all steel from the top of the boom to the corduroy shoes. The revolving frame, carbody, drum side stands, etc., are heavy one-piece castings. The purpose of this unit steel construction is to secure rigidity and in order to obtain the full benefits of this construction all castings are fully machined at the joints and bearing surfaces. It is claimed that this construction insures permanent alignment for all working parts. As a result the shafts always run true and there is less wear in the bearings and in the gears.

These excavators have a small tail swing which is especially important to anyone working in a small area, since a machine of short rear end radius has no trouble in working close or swinging around within a narrow space. Another place where an excavator of short tail swing is valuable is in the excavation of narrow mountainous roads. In some cases by using an excavator of short tail swing it is possible to narrow the width of the road so that many yards of excavation can be saved.

The success of this shovel is largely due to its crowding motion and here are some of its features: It is positive and will bite into the toughest soils; it can force the dipper above the boom point. This is valuable in loading trucks on top of a bank; crowding is independent of hoisting. The dipper can therefore cut a level floor or any slope of a bank; dipper can be reversed rapidly. It is easy to shake off sticky soil; no complicated air and steam engines on the boom and no cables to wear out and full power of the motion can be thrown in the crowd. The shovel is provided with two speed tractions. The high gear provides a fast travel speed between jobs. The low speed gives great tractive effort and enables the machines to pull through deep mud or to climb grades as steep as 35 per cent. All P and H models can be used as shovel, skimmer scoop, hoe, dragline, pile driver, clamshell or crane. The change from one model to another is quickly made by means of a drum spider and lagging. It is not necessary to change the drum or spider in making the change but merely the lagging. In order to give the machines great capacity they are provided with extra large motors so that the line swing and travel speeds are fast.

All these shovels can be shipped on a standard flat car without dismantling. Draglines and cranes are also shipped completely assembled with the exception of the boom which is unbolted at the center.



New P and H Excavator

G. E. Makes Appointments

Burton L. Delack, assistant manager of the Erie, Pennsylvania, works of the General Electric Company, has been appointed assistant manager of the Schenectady, New York, works, effective December 1, 1926. At the same time John St. Lawrence, general superintendent at Erie, has been named to succeed Mr. Delack.

Perfex Radiators

The Racine Radiator Company manufactures the Perfex core radiators which are made in two types, the sectional and one piece. In the former type, the cores are made in sections, each fitted with headers having two or more parts, which register with like parts in the top and bottom tanks. A feature of this design is the use of a common through bolt for holding the sections in place, a cork gasket being inserted between the cast tank and heater. The bolt is inserted

Perfex Radiator

in the cored hole in the tank and through a slot in the core-section header. This bolt is then tightened and results in a perfect joint. This arrangement is valuable in case of damaged section as this can be easily removed and a new section inserted.

The Perfex core, which is used in these radiators, is constructed of a plurality of individual flat corrugated tubes, each with but one joint, a lock seam, and is formed by one piece of metal by a shrinking process that does not stretch or crystallize the material in the manufacture of the tube. This shrinking process also permits of a large water passage and also eliminates the possibility of failure from hardened metal. The material used when making these cores is a special analysis bronze.

G. H. Williams Company Reorganizes

In order to meet the rapid expansion of the G. H. Williams Company, builders of buckets for all classes of excavating and rehandling, a reorganization of the management has just been effected. W. W. Cochrane becomes general manager; J. D. Harter, sales manager; C. D. Buoy, chief engineer, and H. H. Neeve, superintendent.

Loomis Clipper Drills

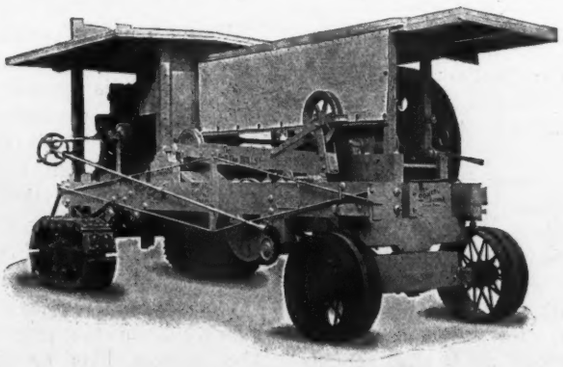
The Loomis Machine Company has recently introduced a new motor truck well drilling and prospecting machine. This motor truck drill is mounted on a truck and by this medium the machine can be moved from one location to another in a short time and with small expense. The drill is built self contained so that it can be taken off the truck at any time and set back again as often as possible.

The drill is very simple; there being only three shafts in the front drilling end reduces the weight of the outfit to a minimum. This is very desirable when mounting the machine on a truck, yet the drill has plenty of strength in its few parts to give the desired snappy stroke to drill quickly. The machine is easy to operate and carries standard equipment, including loose crank with clutch, etc. Only three levers are needed to control the drilling mechanism and these are easily handled, being set close together at the driller's right hand as he stands in position to drill.

The machine can be adjusted either to give a long swinging stroke with a penetrating blow or a faster motion with a shorter stroke by setting back the wrist pin in the crank one notch or more. The frame is made from straight hard timber and has the spring so desirable in drilling to stand hard knocks and yet keep in alignment. On special order this "Clipper" can be obtained equipped with rubber tired wheels with roller bearings and when so arranged can be pulled about by a truck.

This company also manufactures the Loomis "Clipper" blast hole drill with crawler wheels. This was designed to supply the need of a machine required to go over soft ground or where a wide and long traction surface is desired. The crawler wheels allow the weight at the point of traction to be distributed over a large surface, thus avoiding digging in when power is applied to push the machine forward.

The machine has two speeds for moving, a slow speed for bad and soft places and a faster speed for ordinary drilling. It also has a variable speed engine which can be run at such suitable speed as may be desirable on either the low or high gear. The machine has also a new style and improved loose crank which starts and stops the tool instantly by the mere push of a lever. It is easily operated, designed and built simple with a low point of gravity, and furnished with ample power to do more than ordinary drilling.



Loomis Drill

New Centrifugal Collector

The Clark Dust Collecting Company has recently developed an improved centrifugal collector, equipped with special skimmers which can be applied for collecting any type of fine dust in any part of a cement mill or stone crushing plant.

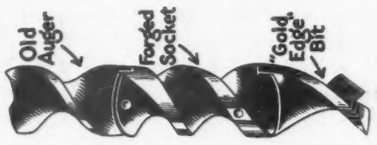
The object of this machine is to skim off and save the dust, which formerly vented out through the top. In this collector there is no cloth to plug up or wear out. It is claimed that this skimmer type collector will recover 99 per cent of the dust.

The collector is also used in what the company call the all metal system, which is an air separator, for removing the coarse material, which is one class of finished product, and the new Skimmer type centrifugal collector for the recovery of very fine dust, this being another type of finished product. The coarse dust is sold for agricultural limestone while the finer dust is sold for asphalt filler and other purposes.

This scheme of producing different classes of finished materials in stone crushing plants is a system which tends to the highest efficiency. This system has been further developed so that three finished products can be obtained namely, agricultural limestone, chick food products and asphalt filler.

Detachable Auger Bit

The Joseph McLaughlin Company has recently placed on the market the detachable auger bit illustrated and does away with blacksmith work on augers. The detachable cutting bit can be furnished in the same size and style as forged bits used at any plant, it can be furnished in any form or width of cutting edge and for any diameter holes.



Method of Making Bit

This new auger bit offers many advantages over the old method of hand forging. It is made of heat treated alloy steel and will withstand long and severe usage without wear. It can also be furnished in special steels and tempers to suit any special drilling condition. It gives a cutting service equivalent to several common bits, and when worn out can be replaced quickly with a new bit without removing the auger from the work.

The connecting socket, for applying the detachable cutter to old augers, carries a similar twist and provides the same cleaning principle as standard augers. A few minutes' time of blacksmith work will make any old auger ready for application of the socket in which any size or style of cutting bit can be used.

Thaleg and Hock Tractocrane

The interesting and useful piece of equipment shown has been designed and recently been put on the market under the name of the "Tractocrane," and distributed by Thaleg and Hock. This small, quick acting crane is manufactured in two models, "I" using the McCormick-Deering and "F" the Fordson tractor as a power unit.

This machine is intended to fill the demand for a small crane at a price that the small contractor, gravel pit owner, building material dealer and coal dealer can afford to pay. It is an exceedingly sturdy, well built crane, designed to stand up under years of hard service. The operating cost is very small and the crane has a comparatively great capacity.

The "Tractocrane" is described at some length in a bulletin number 20 P which may be obtained from Thalog and Hock.

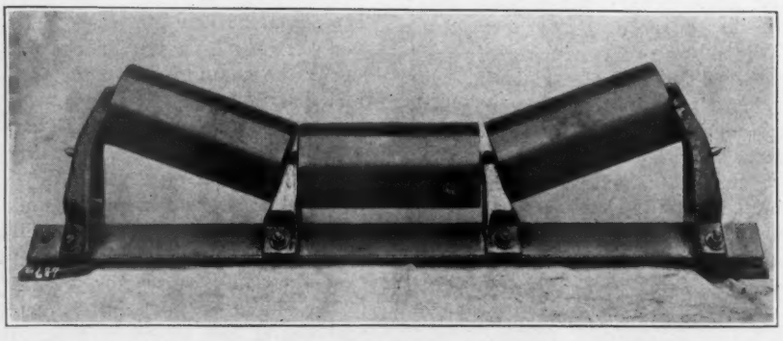
Hudson Tile & Marble Co., 1060 Broad St., Newark, N. J. $125,000. To manufacture tile, marble, bldg. materials, etc.

Robins Developments

A new type of roller bearing idler has recently been developed by the Robins Conveyor Belt Company. This troughing idler, style 203-XD, is unique in many ways. It is similar to other idlers in having three pulleys equipped with Timken roller bearings whose advantages of design and construction are well known. There are, however, different methods of applying these tapered roller bearings to idler pulleys. The adjustment of bearings for wear in the Robins idler is entirely automatic and cannot be tampered with.

It has been demonstrated through years of experience that cast iron is the most durable material for idler pulleys and the Robins idler pulley is of cast iron with closed ends and rounded corners. The closed ends prevent dirt from gathering in the pulley. The rounded corners prevent possible injury to the conveyor belt at the point of bend between center and side pulleys. Danger of damage to the belt at this point is further reduced by making the gap between edges of pulleys as small as possible.

Each of the hollow steel shafts on which the idler pulleys revolve is firmly supported in a fixed position at each end assuring perfect alignment of bearings and preventing uneven wear. To each end of each pulley shaft there is rigidly fastened a bracket block which fits into a socket in the main idler bracket. This design makes it possible to lift out and replace any idler pulley with its bearings, shaft and bracket blocks without the use of tools.



New Type Roller Bearing Idler

The three pulley outfits for any size of idler are identical in every detail, and therefore, interchangeable. The idler brackets are of cast iron with smooth surfaces that do not present pockets or hollows for the accumulation of dust and dirt. After the pulley outfits are slipped into place on the brackets cotter pins are inserted in the tops of brackets above the bracket blocks to hold the pulley outfits in place during shipment and erection. After the idlers are in place on the conveyor structure these cotter pins are unnecessary and may be discarded if desired. The idler "board" to which the brackets are bolted is made of a standard steel angle set with its apex up so that any dirt falling on the idler board will be spilled off the sloping sides and cannot pile up under the pulleys. At the ends of this angle board there are castings to which the angle is bolted and which form the attachment to the structure. These castings are marked to indicate the proper position of the idler in reference to the direction of belt travel.

The high pressure grease fittings for lubricating the roller bearings are located at the ends of the idler board in a position plainly visible and easily accessible, but not projecting so as to be broken off or damaged. The attendant in greasing the idler is in no danger of contact with the moving belt or idler pulleys. The grease from these high pressure fittings is carried by concealed and protected pipes to the grease reservoir of each pulley and provides positive lubrication for each bearing. Each bearing is protected at its outer side by a double grease seal consisting of two felt washers and two steel cages which prevents dirt from getting into the bearing or grease from getting out.

This company also introduced during this year the Robins Vibrex Screen, which was placed on the market after many months of severe field tests. This screen has the following features:

The vibrator is a simple unbalanced pulley turning on heavy Timken roller bearings; the live screen frame is carried on shock absorbing springs so that vibration and power loss is minimized; less than one horsepower is required to operate it. The screen cloth can be changed in 15 minutes and no heavy parts have to be moved; the entire live screen frame is uniformly vibrated; there are no dead areas; the vibrator is forward and rotary in character and it can be operated at a flatter angle than screens in which the movement is perpendicular to the screen surface; and heavy coil springs maintain the screen cloth in automatic constant tension.

Sly Dust Arrester

The W. W. Sly Manufacturing Company developed a continuous screen type dust arrester and this type of equipment has been applied in numerous instances during the course of the year. The standard Sly dust arrester, thousands of which are in operation, is designed for intermittent operation, it being necessary that the fan suction be shut down at certain periods for rapping the dust off the screens.

The continuous dust arrester finds application where the dust creating machinery runs for 24 hours a day or for such long periods that the dust arrester connected thereto must be rapped without interruption to the dust exhaust. This is accomplished by dividing the arrester into two sections, interspersing a distributing chamber with an arrangement of gates which can be operated so that the screens, first in one section and then in the other section, may be cleaned of the dust. This continuous arrester finds application particularly in the cement industry in connection with such grinding and pulverizing equipment as is usually operated day and night.

In numerous cement plants the problem of handling and packing hot cement presents itself. Quick deterioration of paper and cloth bags results from hot cement. A solution has been worked out by this company whereby cement from the grinding units is cooled to an appreciable extent, preventing such deterioration of bags as well as facilitating handling. An installation was made, after considerable tests and experiments. This unit has now been in operation for almost six months and is actually reducing the temperature of the cement at the discharge of the grinding mills from an average of 350 degrees to an average of 240 degrees, an average reduction of 110 degrees Fahrenheit.

The principle of application is that a large volume of air at atmospheric temperature is passed through the cement as it discharges from the grinding units. This air in passing through the cement carries along a certain portion of this cement into a classifier-dust arrester where it gets the full benefit of the cooling air, and is immediately discharged again into the remaining stream of cement flowing from the grinding units to the storage bins or direct to the packers.

15-In Morris Dredge and Booster Pump delivering sand and gravel direct to screens. The booster pump is located in the first building on the bank

Hydraulic Production of Sand and Gravel

MORRIS Centrifugal Pumps, in Standard, Heavy-duty and Solid-lined Types, offer a desirable selection for any producing rate, any practical delivery distance and elevation and for most economical handling of a wide variety of deposits.

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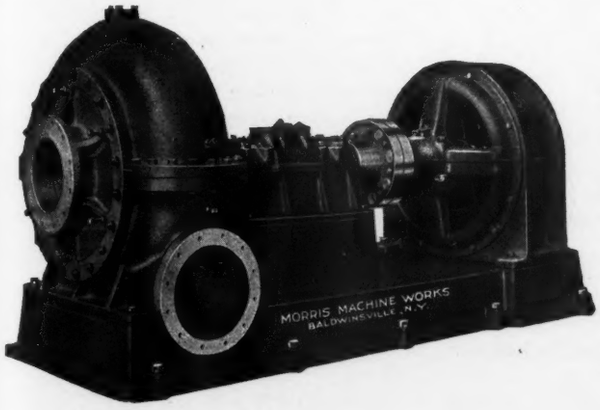

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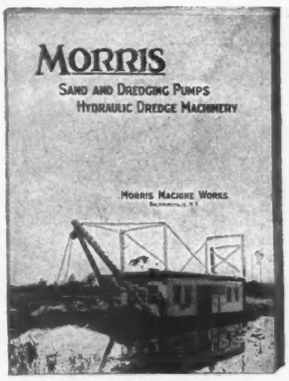

THIS booklet contains over 125 illustrations and 56 pages of reliable information as to where, why and how hydraulic methods should be used.

If you do not, but ought to utilize centrifugal pumps for handling solid or semi-solid materials, or if you want to check up performance of your equipment with what it should be, you will find many valuable hints throughout this bulletin.

Thousands of experienced Engineers, Contractors, Producers of sand and gravel, Manufacturers with handling problems and others have derived exceptional profits from hydraulic methods by means of centrifugal pumps. Many of these men have benefited from Morris advice. If you want cost and performance data, and suggestions as to your particular needs, give us details when writing for the bulletin.

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Baldwinsville, N. Y.

Originators of Centrifugal Pumps, both Single and Multi-Stage, and builders for practically all purposes since 1864.

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Sales Representatives: Buffalo, Kansas City, Omaha, Denver, Salt Lake City, Portland, Ore.; Los Angeles, New Orleans, Huntington, W. Va.

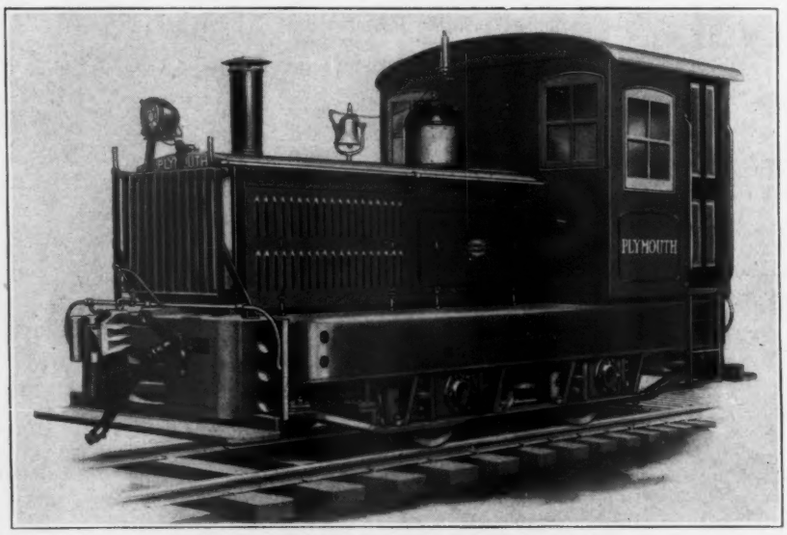
Canada: Story Pump & Equipment Co., Toronto.

MORRIS
CENTRIFUGAL PUMPS

New Plymouth Locomotive

The Fate-Root-Heath Company has recently issued bulletin A-11 describing its new model H L C 24-ton Plymouth gasoline locomotive. This locomotive is especially constructed for heavy duty service in quarries and for moving loaded cars.

The frame being all steel, girder beam and bar side construction with cast steel bumpers, affords a foundation that insures good protection to the working parts against the strains and stresses of operation. The cab and canopy are also all steel construction provided with sliding windows in the front and sides of the cab, thus affording good vision in all directions. When used on standard gauge tracks the cab is built nine feet wide enabling the operator to readily see alongside of the box cars. The locomotive is operated from the right hand side of the cab which enables the operator to easily receive signals from the switchman.



New 24 Ton Plymouth Locomotive

Power is obtained from a high grade gasoline engine and the various speeds received through a modern sliding gear transmission. The clutch is a combination twin disc and Plymouth with four facings 14 inch outside diameter and 7 inch inside diameter. The clutch retarding brake is 9 inches in diameter. The pilot bearing in the flywheel is lubricated with an alemite gun through a hole drilled in the clutch shaft. The brakes are of the lever type and are placed between the wheels, the shoes engaging both the tread and flange of the wheels. The brake mechanism is arranged to equalize regardless of wear on the wheels or shoes. The axles are carried in Hyatt high duty roller bearing with hardened steel sleeves to receive the wear. The bearings are lubricated by means of alemite grease fittings. This locomotive has four speeds forward and reverse and is capable of attaining 15 to 24 miles per hour in high gear.

New Buda Appointments

The Buda Company announces the following appointments: John P. Mahoney, executive engineer, in charge of all engineering for the Automotive, Power Plant and Industrial divisions. Mr. Mahoney, who formerly directed the sales of these divisions, will also have general supervision of service activities with Walter Petty, formerly chief engineer of the Service Motor Truck Company and the Maccar Truck Company, in active charge as manager of the Service Department.

Guy B. Wright, as sales manager of the Automotive division, will have charge of sales in the bus, truck, taxicab and marine divisions, and R. K. Mangan, as sales manager of the Industrial and Power Plant divisions will have charge of the sales of these two divisions.

Non-Clog Williams Crusher

The Non-clog Williams hammer crusher, manufactured by the Williams Patent Crusher and Pulverizer Company, is the latest improvement for handling wet rock or rock containing wet muddy overburden, and should be of interest to cement plants and similar operations where wet clay and shale is ground along with the stone.

Heretofore, the big difficulty in crushing damp and wet material has been that the wet sticky material sticks and builds on the breaker plate, finally choking the machine. However, with the non-clog arrangement, moving parts which carry the rock into the crusher replace the standard stationary breaker plate and by keeping the feed constantly agitated, prevents choking and building. Two types are offered, the Revolving Roll and the Tractor type.

For extremely wet material the revolving roll is recommended as it has no links, openings or complicated mechanism into which rock and soft plastic material can wedge and pack. It consists of a single large diameter smooth face roll against which the hammers reduce the material. It is rotated while the crusher is in operation and is cleared by a scraper on each revolution so that a clean surface is always presented to incoming material and it has no chance to accumulate. This roll can also be heated by steam or electricity which further reduces the tendency of the wet material to stick.

The outer shell or casing covering the roll is made sectional, the sections of which are made of manganese steel and can be easily replaced when worn. The roll type non-clog breaker plate is the original equipment perfected for hammer crushers and has been used on material consisting almost entirely of wet clay so heavy with moisture that it was extremely plastic, yet the crusher did not clog.

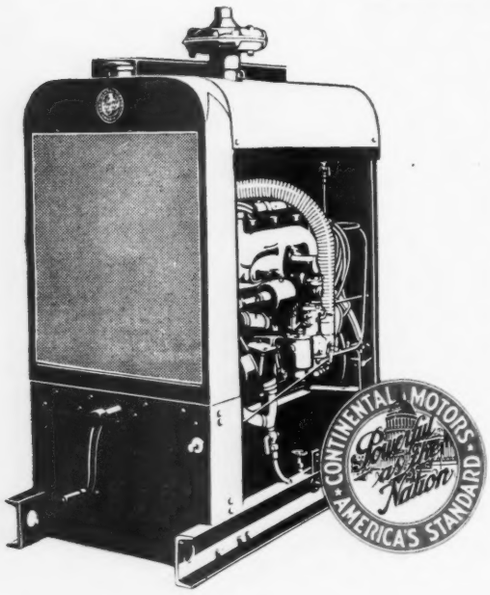
For handling semi-dry material or other work where the clay and rock does not lodge between the links, the tractor type is offered. It consists of a series of heavy links similar to the treads of a caterpillar tractor, the whole making an endless chain which carries the material into the crusher and which serves as a breaker plate. Either of these types is offered with self-contained drive, in each type the movable breaker plate mechanism being driven from the main crusher shaft by a silent chain drive tightly encased to keep out dirt and grit, so that no extra drive is needed.

Telsmith Rotary Grizzly

The Smith Engineering Works have recently placed on the market the Telsmith rotary grizzly. This grizzly was installed first in copper mines where it proved so successful that the Smith Engineering Works decided to market it for gravel plant operations. During the past year some fifteen installations have been made in quarries and gravel plants in the United States. These installations are proving very successful in solving the scalping problem.

The grizzly is offered in three sizes known as number 30, 36 and 360. The largest rock which should be fed to these grizzlies is 4, 5 and 10 inch respectively.

Power for a ~ thousand uses



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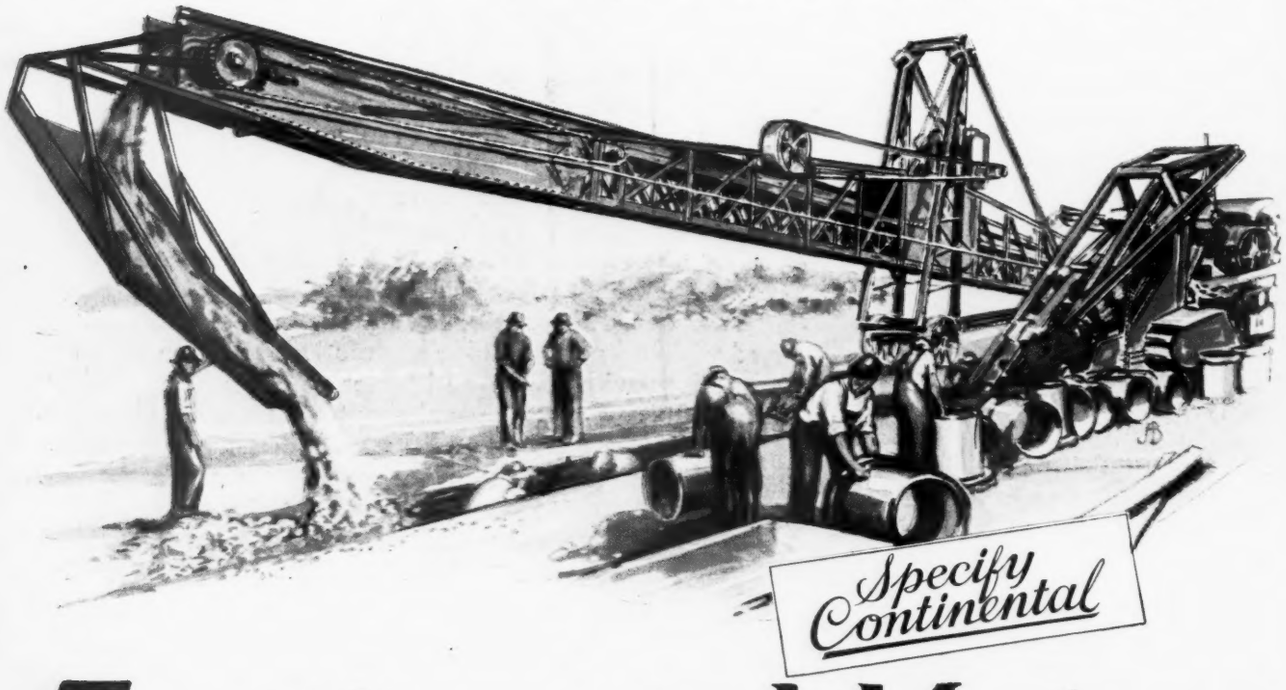

Continental Motors